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MOTOR AGE

Volume XXXVIII
Number 23

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, DECEMBER 2, 1920

Thirty-five Cents a Copy
Five Dollars a Year

Do You Want a Share of These Essex Profits?

The Essex satisfies the keen instinct of American motorists for real value.

That is why it made the greatest sweep in all motor history during the first year of its introduction. Fifty thousand are now in service. That is more than 2250 cars a month.

There is a profit in handling a car that sells like that. Its sales records match its popular fame. Dealers take pride in handling it. They share the friendships it makes, and those friendships bring other sales and growing profits.

What the public thinks of a car is accurately reflected in the profits of the dealer. With the Essex you sell the car the people

want. The prosperity of Essex dealers proves that.

Some might point to the high type of dealers who handle Essex as an explanation of big Essex sales. This in part is true.

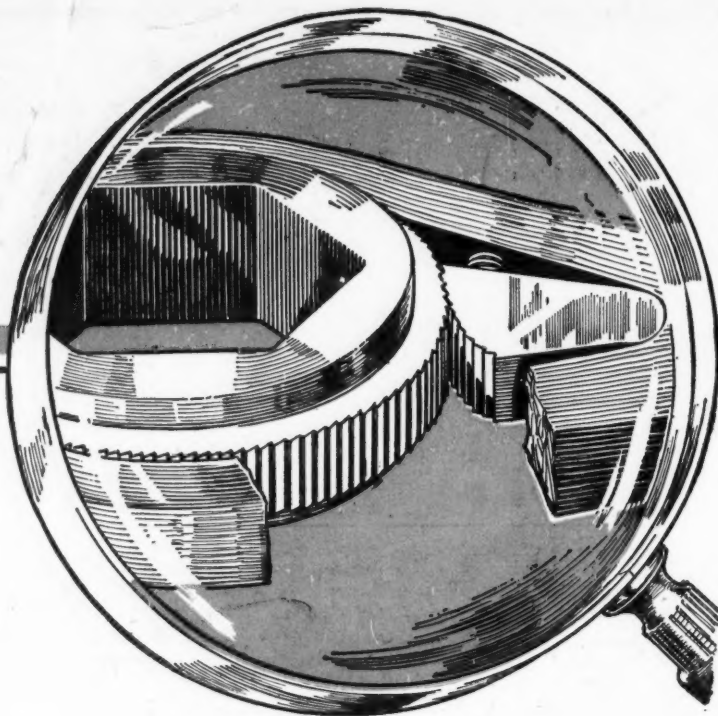
But other capable dealers, handling less wanted cars, know how small are the profits when sales are made only through beating down the preference for the more wanted car.

Back of the Essex is an organization, known internationally as representative of the best in the automobile industry.

These are reasons you should consider the Essex in your particular locality if you are looking to a permanent and profitable business.



(E-18)



BILLMONT

A Ratchet Wrench that works in the smallest possible space. If you have half an inch leeway you can turn that nut with the Billmont Ratchet. For the fine teeth on the heat treated, solid steel Pawl catch and hold with the slightest lateral movement of the handle. The ratchet is also heat treated and milled, the handle drop forged. The simple action of the Billmont Ratchet Wrench, as shown above, is reversible without any additional parts or complications. Simply turn the wrench over and work the other way. Two extensions go with the Billmont Ratchet Wrench, one 6 inches, the other 11 inches in length, so that deep seated nuts or bolts can always be reached, and like all other Billmont Wrenches, the Ratchet opening will take any of the 24 different sized Billmont sockets.

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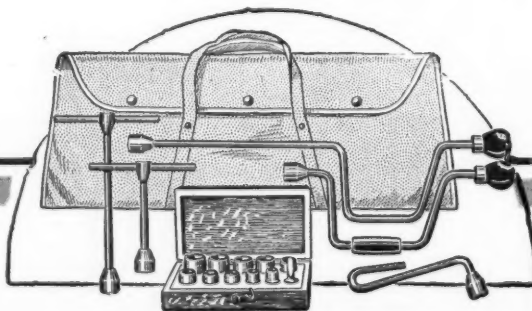
No. 10 Extension, 11" long—fits all Billmonts.



No. 8 Ratchet—(Drop forged).



No. 9 Extension, 6" long—fits all Billmonts.



MOTOR AGE

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Presto Products OVER ONE HUNDRED MOTOR CAR NECESSITIES



The Season Is Here
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PRESTO Electric Heater

Winter is here in full force. Make this season the biggest you've ever had by selling cold weather specialties that have already proved their popularity among motorists.

Sell the Presto Heater. The popularity it has enjoyed for several seasons is your assurance of many sales.

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Metal Specialties Mfg. Co.

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Chicago, U. S. A.



A \$25,000 Pierce Arrow

built for Mr. Roscoe Arbuckle, alias "Fatty," of international screen fame. This car is equipped with Houdaille Hydraulic Shock Absorbers.

—and Houdaille Shock-absorbers

HOUДАILLE Hydraulic Shock Absorbers automatically check the rebound and help eliminate skidding, which is often caused by side sway. This means tire economy and comfort even while riding over the roughest roads.

*Mr. Arbuckle says:
"I think Houdailles are
wonderful things!"*

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THE HOUДАILLE COMPANY

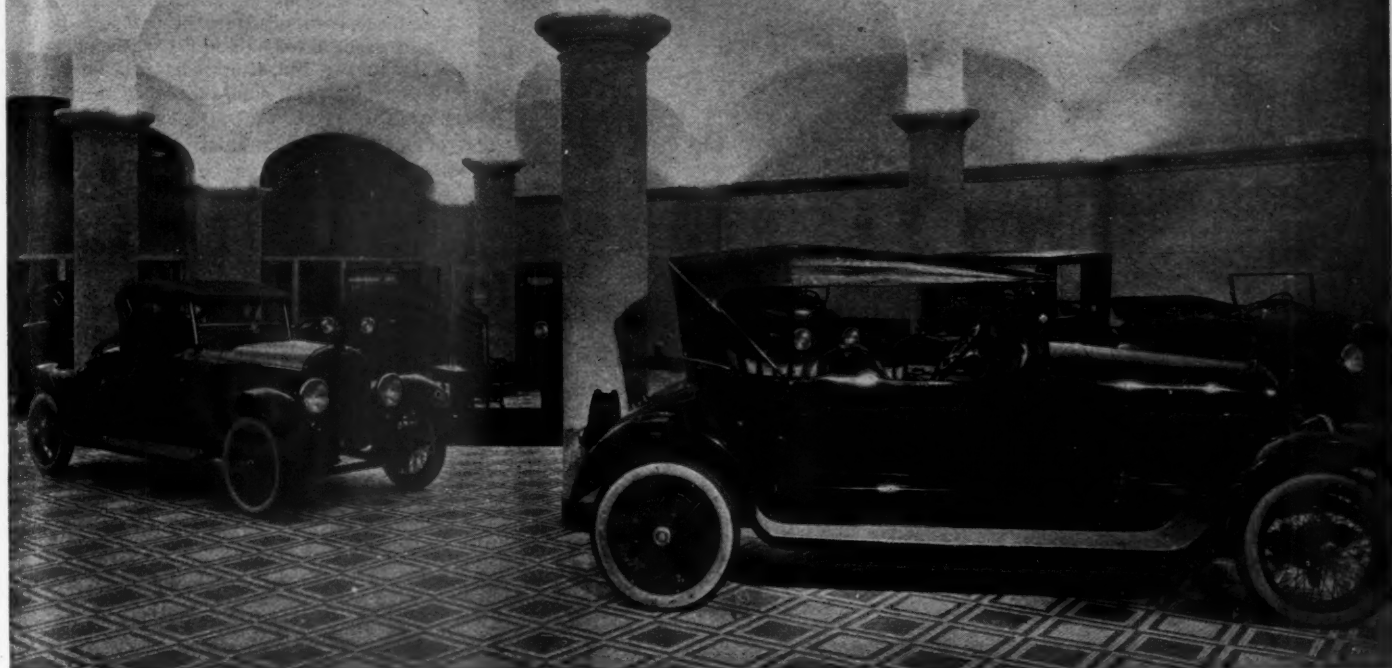
BUFFALO



NEW YORK

Mfg. by Houde Eng. Co.

MOTOR AGE



This is the salesroom of the Chicago-Marmon Co. The lighting scheme is the indirect method. From the tops of the columns the lights throw their beams to curved ceiling, which in effect becomes the illuminating source

Lighting the Automotive Building

*The Result of a Study of Lighting by Illumination Engineers and
Its Effect on Sales and Service Efficiency*

BY ROY E. BERG

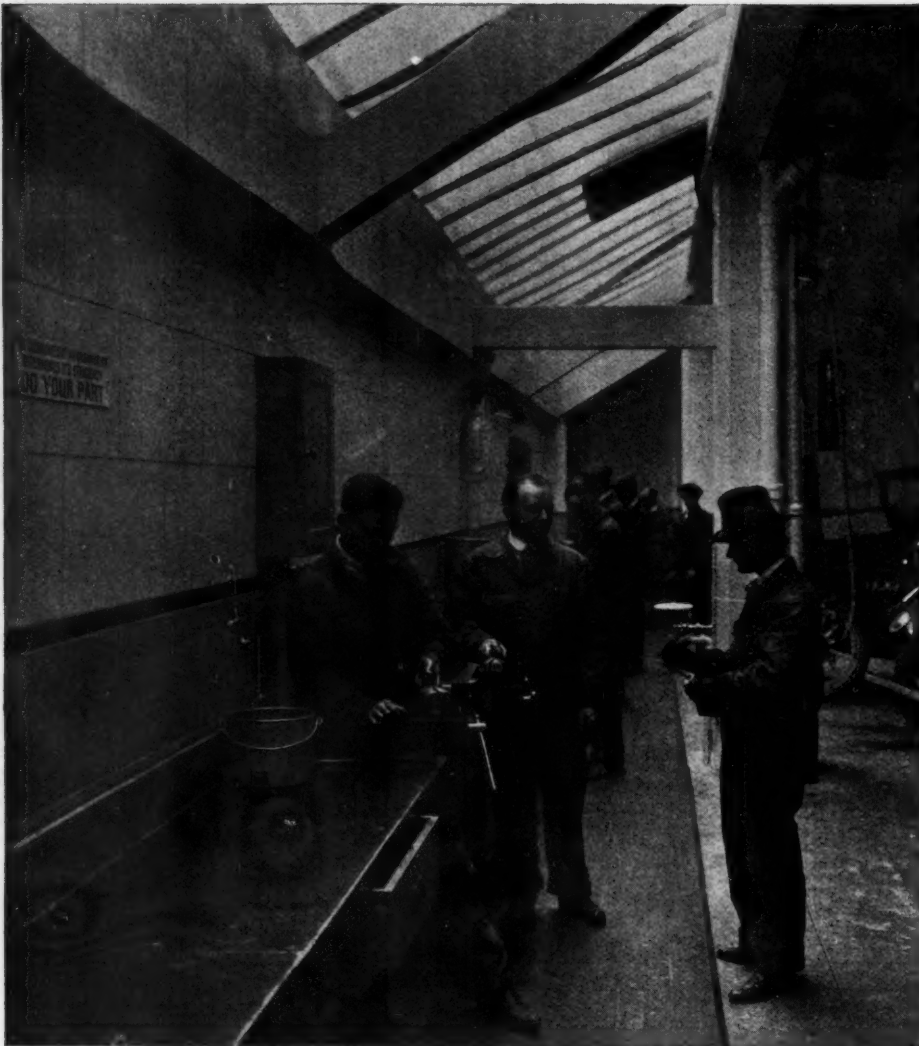
ILLUMINATE the interior of your building and increase the efficiency of your organization! If it were possible to compute the inefficiency of our industry throughout the land caused by the inadequate and improper use of illumination, the result would no doubt stagger the wildest imagination. *Factory men, those who are concerned with the efficiency of the organization, have stated that with the proper use of lighting equipment and the proper application of white or light colored paint they have increased the efficiency of their organization twenty-five per cent, which is another way of saying that the output of the plant is likewise increased.*

The dealer at first thought apparently does not fit into any scheme of things where such inefficiency reigns, but after all, is his organization not concerned with the output just as much as any other establish-

ment, be it a factory or a drug store? The output of a service station is directly dependent upon the illumination, and the salesroom, where large sums are spent for the purpose of creating neat and attractive effects and for producing environment suitable to the tastes of the customer, must have its proportionate share allotted to the illumination scheme.

We are concerned with two kinds of light, daylight and artificial. The more we make use of the former the less we must call on the latter.

Daylight concerns us more deeply than does artificial light, for were we to neglect daylight altogether, our buildings would have to be lit by artificial means, which would do more than just make a hole in the company pocketbook. Furthermore, daylight being cheap



Showing the splendid daylight illumination used in the service station of the Howard Automobile Co., Buick dealer of San Francisco. In a building of this type no time is wasted looking for extension cords and no time is wasted through fumbling and groping in the dark

and easy to obtain we should devote some thought to it with the idea of making effective use of it.

A salesroom, of course, must not apply factory daylight lighting principles for its illumination. To do so would be to destroy the artistic effect of the display. In many cases the limit of daylight application to a sales room is confined to the building frontage and in such a case the whole front is generally constructed of plate glass. More often a dealer's establishment is located on a corner in which case more window space may be gained for the salesroom.

Our first problem is to discuss the whys and wherefores of securing more light through an efficient layout of the windows in the sales room and in the service department.

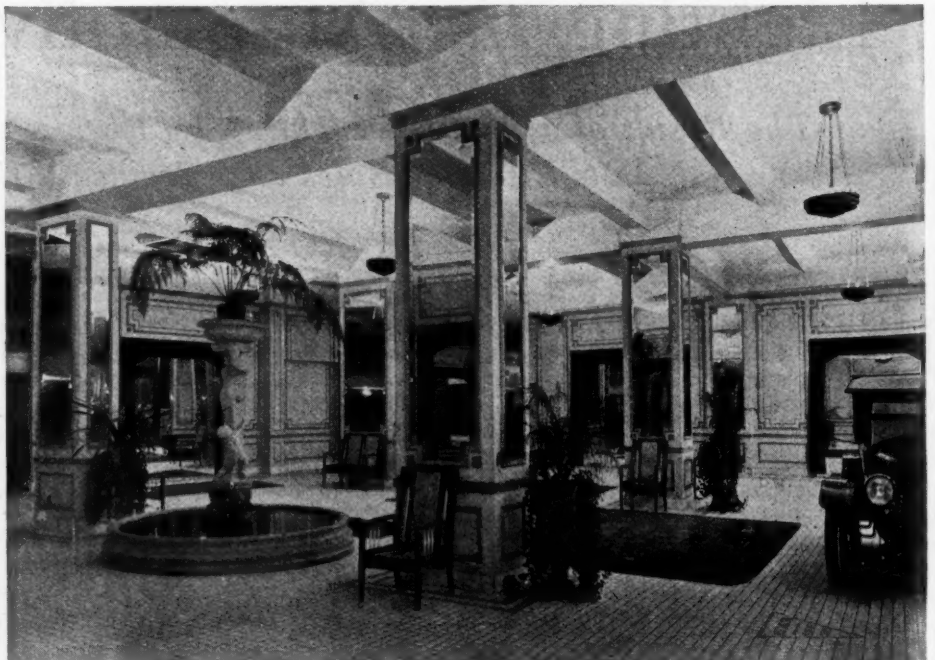
The majority of the dealers' establishments in this country are, we believe, of one-story construction. As many as possible are located on a corner but these probably do not constitute a majority. However, the majority of the buildings probably have one corner which may be utilized to good advantage by installing glass in both walls of the corner rather

than glass in the front wall and brick for the side.

Too much daylight admitting surface is an unattainable feature in connection with a dealer's building. Suppose one built a sales room large enough to accommodate a car travelling in a circular path, travelling continuously as we often hear of dealers doing for advertising stunts. Suppose also for the sake of argument that a car was left outside the building to travel in the same unattended way. It is certainly reasonable to expect that more people would stop to note with more than passing interest the car outside the building than the one inside the building performing in the self same way. Even though we had glass walls on three sides of the building it is probable that the car outside would be the more popular.

The daylight admitting powers of a skylight are not to be lost sight of in considering the sales room. The light admitted through overhead windows, has a greater illuminating power than a similar area devoted to side or wall windows. Hence, whenever it becomes possible to install skylights it should be done. As to the type of skylight to install, there is but one type to use for sales room purposes, namely, the type where the skylight is used in connection with a lower sash. This construction serves to illuminate any direct glare from the effect of sunlight, and direct glaring rays is something that should be avoided whenever possible in any illumination for motor car display purposes.

Oftentimes a building located on a very busy street will have as its direct outlook, a view that forever holds something of interest to one gazing out upon the street. In types similar to this the customer's interest is often attracted by the outside interests thus diverting his attention for a brief moment from the salesman's talk. It is found that an effective



This is the salesroom of the Hudson Motor Car Company of New York, which is illuminated by indirect fixtures. From this picture it will be noted that there is an utter lack of glare and that there are no contrast shadows

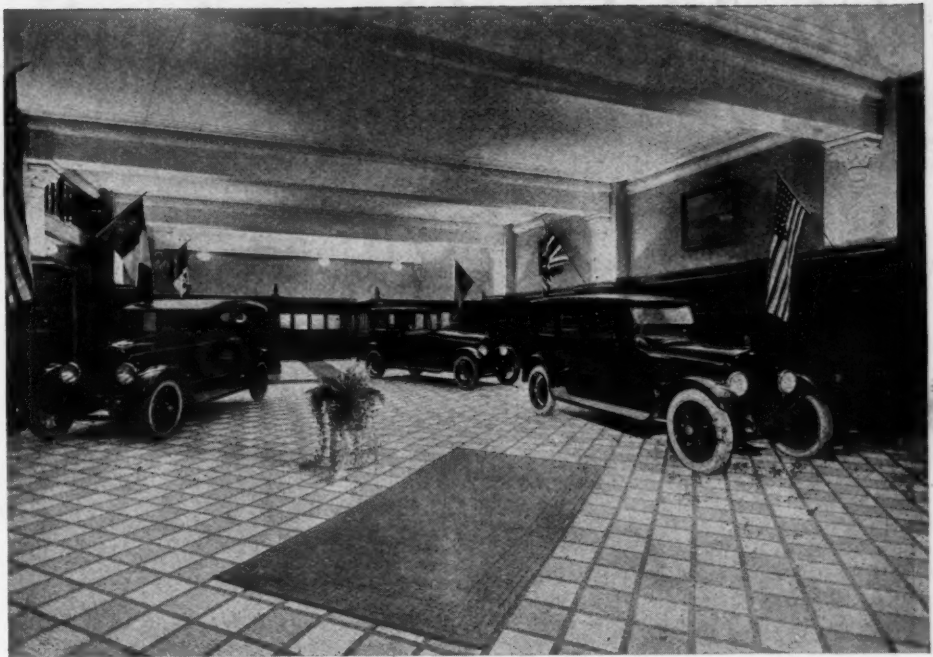
use of plants, or better, a neat partition just two or three feet high will serve as a means to prevent the customer's attention from being diverted. Then the space between the window and the partition may be used exclusively for display purposes. The partition need not be so high that it will prevent the passers-by from peering in.

The protest may be raised that many dealers have their buildings constructed and that it will be impossible to further consider the daylight proposition. The answer to this is that he who considers the future at all certainly is planning for future expansion. Maybe the anticipations go so far that a new building is in mind which will include all the considerations of daylight lighting. But that is the future and this is the present. The efforts spent now to make the present building more productive from a lighting standpoint will not be wasted.

We have in mind a Chicago dealer who recently constructed a new sales and service building. The building was designed by an architect who knew his business, but after completion it was decided that more daylight could still be provided. Accordingly, the roof was changed slightly and two more skylights were built in. The results were worth while in the estimation of the owner, even though the building was provided with very good daylight facilities in the first place.

So it is with other dealers' buildings. Perhaps there exists a brick wall which could just as well be of glass. From an investment standpoint the cost of the change would easily be returned by the increased output made possible by the greater light.

The service building and its output are entirely dependent upon the character of illumination. Any disproving contentions of the foregoing statement may be swept aside by asking the contender to repair a carburetor or a magneto in the dark. It simply can't be done. Since daylight is so inexpensive it might just as well be used in wholesale quantities. Daylight is one thing that has as yet not been



View of the Nordyke and Marmon Co., Indianapolis, showing the indirect lighting from the wall fixtures which are incorporated within the columns, thus hiding the fixtures from view

taxed. There is only one objection to the generous use of glass walls in a service building and that argument holds water in northern climates only.

The buildings of the South need not consider the coal bill but the dealer of the North many times finds it a problem to heat his building and this is the only reason that may be advanced against the use of glass walls such as we want to see in modern factory buildings. However, with the use of modern sash, the argument against the use of glass walls becomes very materially reduced. It used to be that glass walled buildings were synonymous with air drafts and large coal bills, but our sash builders must be given credit for producing correctly designed window cash, capable of retaining the heat and excluding the cold.

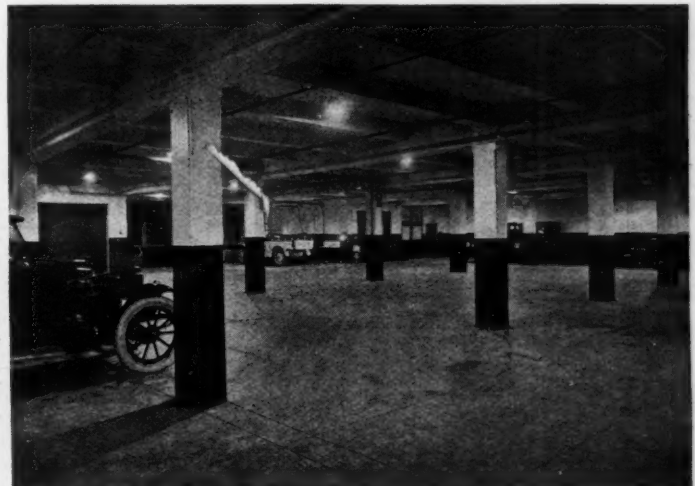
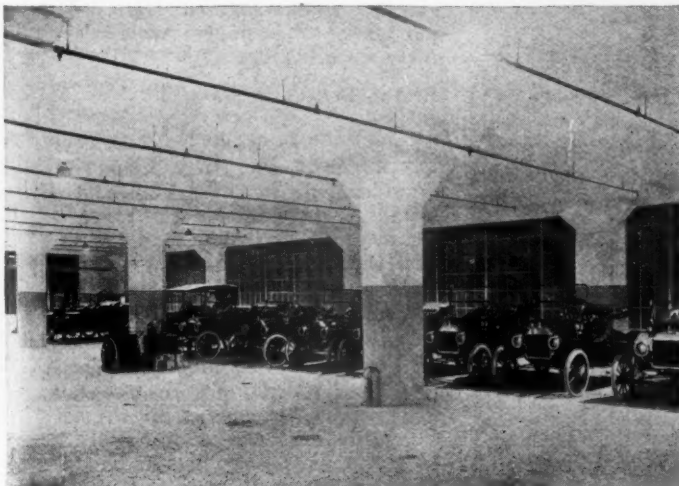
A one-story service building may be adapted ideally to skylights. The illus-

tration of the service building in these columns of the service building with the skylight over the bench shows a particularly well lighted shop. Here, too, a ventilator has been applied which may be done effectively in conjunction with a skylight. This, however, is a side issue on the subject of illumination.

The type of service building which will ultimately succeed other types will follow closely the practice as now followed in factory construction, where the roof is supported by columns, and the wall area between the columns is of glass; furthermore, the roof will be composed largely of glass made possible through the effective use of skylights.

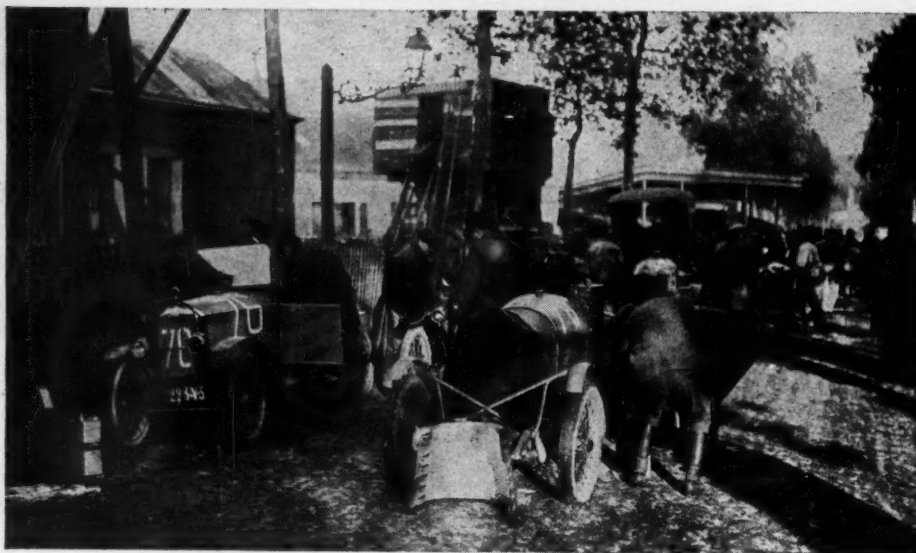
Considering next the subject of illumination as obtained by artificial means we have several types of illuminants in use, but the most widely used medium for

(Continued on page 53)



Left: First floor of the Ford station in San Francisco. The lighting effect in this place is secured from direct reflected light. A large number of comparatively small lights are used rather than a few very bright light sources. Right: The service department of the Hudson Motor Car Company of New York does not suffer from lack of artificial light, as this picture shows

76 Miles On a Gallon of Fuel



Warming up for French fuel competition—some of the drivers ran the water to the boiling point. At the left is the four cylinder Peugeot that went 76.1 miles to the gallon

By

W. F. BRADLEY

European Correspondent of Motor Age

AVERAGING 28.3 mi. to the American gallon, a Voisin sedan with sleeve valve engine of 3.7 by 5.5 in. bore and stroke, total weight 5,324 lb., won the French fuel economy competition and established a world's record for this class of performance.

The competition was run on a closed circuit near Le Mans, guarded by troops and having official controllers at distances of not less than one hundred yards. The amount of fuel to be allowed to each competitor was calculated in advance and was based on piston displacement, weight, and nature of the

19,550 lb.

A standard four-passenger Citroen, as delivered to clients, but with special carburetor tuning, got third place with 50.9 mi. to the American

gallon. The highest mileage per gallon recorded by any of the eighty odd competitors was 76.1 for a four-cylinder two-seater Peugeot Quadrilette driven by a French technical journalist under the nom de plume of Paul Chap. This type of machine was brought out by Peugeot about a year ago, and had tandem seating. Chap had a special body built with side by side staggered seats. A large number of Citroens averaged better than forty miles to the gallon.

Prefer Benzol to Gasoline

Under the rules, competitors could use any kind of fuel they liked, but the allotment was made on bulk, and not on weight. The majority preferred benzol to gasoline. Two grades of gasoline are available in France, heavy and light; only a few preferred the former to the latter. One machine ran on pure kerosene. This was a Unic four-cylinder five-passenger weighing 4,386 lb., which was given 3.7 gal. of kerosene, on which it covered 66 mi., or at the rate of 17.9. The Unic engine measures 4 by 5.9 in. bore and stroke, and has direct injection of kerosene into the combustion chamber when a partial vacuum has been formed by the Bellem system.

A Fiat 1½ ton truck on pneumatic tires used 60 per cent benzol and 40 per

body. Under this arrangement all the cars were started practically at the same time, and the one covering the greatest distance was the winner.

The four-cylinder Voisin sedan, driven by Cabaillet, petered out after covering 136 mi. Second prize under this rule fell to an entirely different kind of vehicle, a Chenard-Walcker pneumatic tired tractor hauling a special four-wheel pneumatic tired trailer loaded with bottles of beer. This combination covered 124 mi. on 16 gal. of fuel, or at the rate of 7.7 ml. per gallon. The Chenard-Walcker has a four-cylinder engine of 3.1 by 5.5 bore and stroke, and the total weight of the combination was



French Fuel Economy Test Shows Startling Results—Contest Based on Piston Displacement, Weight and Nature of Body

76.1 MILES

50 mi

stop with its tank empty, it was a simple matter to check up its distance between the hundred yard posts.

Warm Up Before Starting

It was permissible under the rules to warm up the engine before starting, and everybody took advantage of this to the full. About ten minutes before the start the main tanks had to be emptied, and

this meant stopping the engine, but precautions were taken to conserve the heat thus obtained during the preliminary running. Some of the drivers ran their water to the boiling point in order to have a correct temperature after the engine had cooled off a little while waiting for the actual start. All realized the necessity of running at a fairly high temperature, and radiator muffs or screens and radiator thermometers were commonly employed.

The Voisin team made the most careful preparation for the competition. In view of this test the compression of the two engines was increased to 113 lb.

cent kerosene, with the Payenhet carbureter, and averaged 11.6 mi. per gallon with a total weight of 7,197 lb. The truck had been bought from the French army stores. Another Fiat, with a four-cylinder engine of 3.1 in. bore and stroke, hauled a light trailer, making its total weight 5,346 lb., and averaged 19 mi. to the gallon.

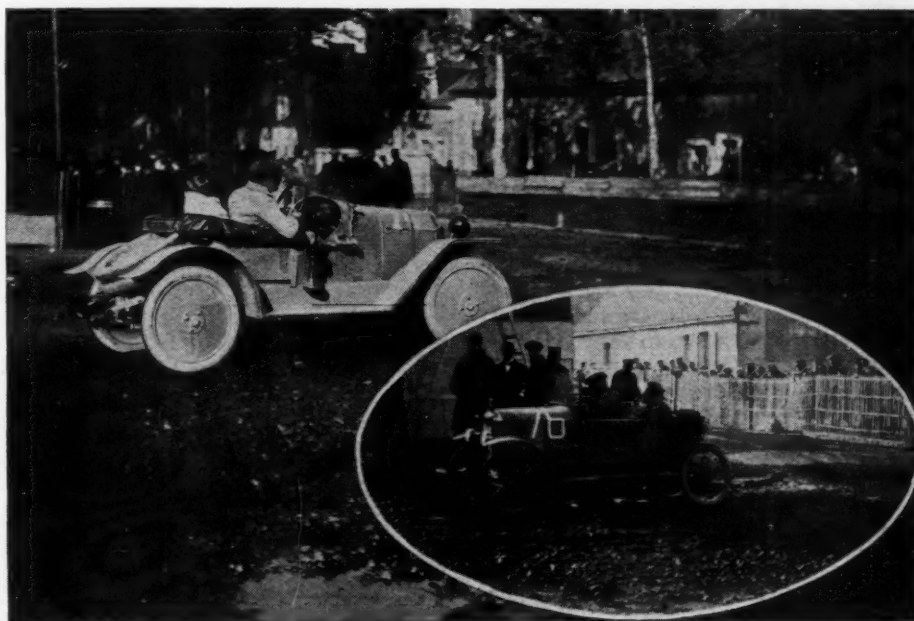
America was represented in the competition by a Scripps-Booth, several Fords, and one Cadillac. Although fitted with European carbureters, the Scripps-Booth having a Claudel and the Cadillac a Standard, these two were last in their respective classes, the former averaging 24.7 mi. to the gallon and the latter 12.9. The best Ford performance was put up by Leroy with 22.7 mi. to the gallon, using a Ford carbureter with modifications. Delbecker, a Claudel expert, had a higher average, with 26.1, but went a shorter distance. He worked under a handicap, for he had adjusted his carbureter for benzol and was given gasoline instead.

Gasoline Costs \$2.10 a Gallon

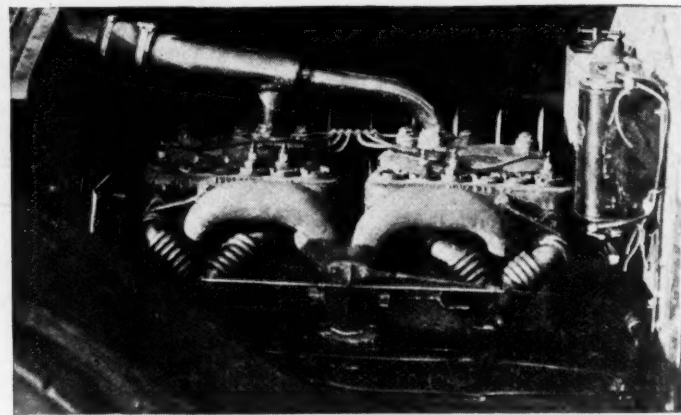
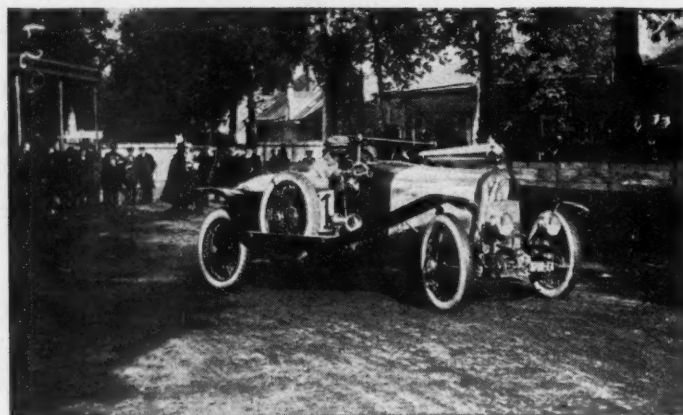
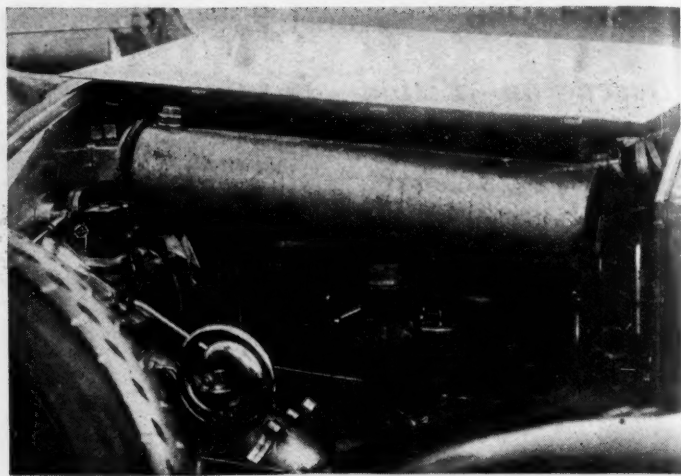
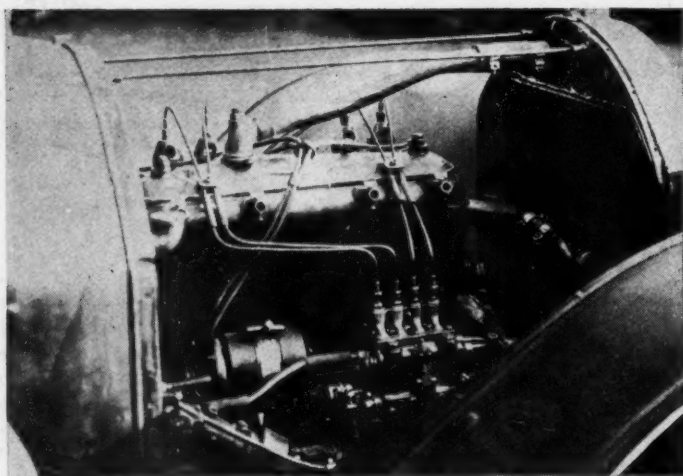
Owing to the present high cost of fuel in France, where a gallon of gasoline averages \$2.10, the greatest interest was attached to these trials. Practically all the cars were entered by manufacturers, by carbureter makers, or by dealers interested in some particular carbureter. Elaborate precautions were taken to prevent dodging the rules. Special gravity tanks had to be fitted for the competition, and the ordinary tanks had to be emptied. Electric starters were all disconnected before the competition began. The course measuring only about eleven miles around, it was possible to guard it very efficiently and both troops and observers were placed around at close intervals. The entire course was marked off at intervals of 100 yards, and each observer given a hundred yards section to control. When a machine came to a

Ten Best Performances in the French Fuel Consumption Trials, Irrespective of Class

	Weight lb.	Fuel Gal.	Miles Cvd.	Miles per Gal.
1. Voisin, Cabaillet	5324	4.8	136	28.3
2. Chenard-Walcker, Lagache.....	19550	16	124	7.7
(Trailer)				
3. Citroen, Barbier	2568	2.2	112	50.9
4. Peugeot, P. Chap	1201	1.3	99	76.1
5. Sizaire-Naudin, Carteau	4122	3.3	96	29
6. Citroen, Repusseau	2579	2.2	96	43.1
7. Voisin, Artault	3968	3.1	94	30.3
8. Mathis, Flambard	2204	1.9	93	48.9
9. Citroen, Chateau	2590	2.2	90	40.9
10. Mathis, Lahm	1984	1.6	89	55.6



In oval: Two-seater Peugeot which ran 76.1 miles to the gallon. Upper view: Mathis light runabout which did 55.6 miles to the gallon



Upper left: Unic engine with direct injection of kerosene under Bellem system. Upper right: Sizaire-Berwick had its competition tank under the hood. Lower left: Voisin touring car which ran 30.3 miles to the gallon. Lower right: Six cylinder Excelsior with Twin carburetor hot water coils around intake manifold and steam injection into mouth of carburetor

Both the sedan and the open touring car had bodies specially designed by Gabriel Voisin to reduce head resistance to the lowest possible figure. The competition gasoline tanks were shaped like a torpedo and mounted on top of the hood, the outlet being at the front end, direct to the carburetor by gravity. Both men drove for economy and on the hairpin turn, where the road had been plowed up, they stalled on a couple of occasions. In order to show that he had power in reserve, when required, Artault ran his last lap at 60 mi. an hour.

There were several cases of hot water injection. On one of the cars a lead was taken from the top of the radiator and another from the top of the dashboard gasoline tank, and the two brought into the inlet manifold, with the idea of getting a steam and gasoline vapor into the cylinders.

The six-cylinder Excelsior, which had two Claudel carbureters, had the intake pipes wrapped with coil of copper pipes circulating water. In addition there was a lead from the radiator overflow to the mouth of the carburetor, so that the engine was always aspiring steam or hot air. On one of the Majola cars an attempt was made to recuperate heat units from the exhaust. A pipe connected to the exhaust was brought up to a filter on the forward face of the dash,

and the gases then led into the intake manifold. It was claimed that a certain number of heat units were put back into the cylinders.

It being the first time a fuel economy competition has been held in France, the formula under which fuel was allotted was more or less an experiment and this was admitted by its author, Charles Farouz. It proved to be very successful.



Chenard-Walcker tractor and trailer on pneumatic tires, weighing 19,550 lbs. It ran 7.7 miles per gallon

Two other formulas were, therefore, adopted in addition. In order to take speed into consideration, the formula

$$R \text{ equals } \frac{PV}{C}$$

in which P equalled total weight, V speed and C consumption, was used, with the following result:

	Points
1. Voisin, Artault	1527
2. Voisin, Cabaillet	1248
3. Rolland-Pilain, Pilain	1035
4. Citroen, Barbier	

Another classification was made on the basis of cost per passenger per hundred kilometres (62 miles) gasoline being taken at the average price around Paris.

The following result was obtained:

1. Citroen, Barbier	0.478
2. Voisin, Cabaillet	0.495
3. Citroen, Penaud	0.541
4. Buchet, Brouin	0.547
5. De Dion, Bocchi	0.592
6. Citroen, Chateau	0.605
7. Sigma, Pelissier	0.613
8. Peugeot, Chap	0.653
9. Sizaire-Naudin, Carteau	0.664
10. Sigma, Raguenet	0.690

Under this formula the competitors using benzol had some advantage for the cost of this is \$1.60 per gallon, compared with \$1.90. These are prices just outside Paris, where cost is lowest.

Special Tools for Service Stations

How the H. H. Franklin Mfg. Co. Designs Tools for Its Dealers to Assist the Proper Servicing of the Car They Sell

By **PAUL WILLIAMS**

Service Manager, H. H. Franklin Mfg. Co.

FOR proper work in the shop we must have the right quality of men and efficient tools for them to work with. The tool equipment required for the best work can be divided into three main classes:—

1—Commercial wrenches (this includes such wrenches as standard open end and pipe wrenches).

2—Specialty tools. These are made by companies making special automobile tool equipment, such as valve grinders, etc.

3—Tools required for the particular make of car the dealer is handling.

By special tools for dealers, we mean the tools that fall in the third class, or in other words, tools for a given type of car only and these would generally be useless on any other make of car.

The Franklin company in the past made a few special tools, such as wheel and gear pullers, to take care of special features in engineering design where it would be next to impossible to do the work with any commercial equipment or with some makeshift tool made in the service shop.

Notwithstanding having these special tools, it was found that complaints of owners on an excess charge for labor are very often due to a serious loss in time in removing or assembling some old parts.

If you will look over a quantity of repair bills you will be surprised to find the wide variation in time and amount of material required that can be directly traced to inefficient methods of removing old parts.

This occurred not only where commercial standard tools were used, but also with the factory designed tools. The factory designed tools failed to do their work efficiently as they were made without giving due consideration to the difference between working on a new car where one needs merely to be able to disassemble work that is in the same condition as when assembled, whereas in actual practice, they are to be used to remove parts that are rusted in place, warped so as to bind and in some cases partially mutilated.

To cope with this situation we have secured the services of a man who has had a thorough machine shop training, including tool design, and has been successful for a number of years in handling a good-sized service station. He has no other duties than to study the tool requirements of dealers and to obtain for them the best source of supply for the tool required.

Turning again to the three classes of

Better Tools— Better Work

"ONE of our greatest problems today is to get better class repairmen by lessening the rate of labor turnover in the shop and by educating the men to do better work. The men in the shop are more content when they do good work and show results. Nothing can dull their interest more than to damage the material they are working on with improper tools. This pride of the shop men in their work is indispensable to the highest grade of service and the proper tool equipment is certainly a great aid to this end."

tools, we endeavor, wherever possible, to urge the dealers to use standard tools and equipment. We also keep track of the equipment placed on the market by specialty companies, recommending such tools and seeing that the maker keeps sufficient of these in stock to take care of our service station requirements. Then for such work as cannot be covered in the most efficient manner by tools in either of the above classes, special tools are designed and in designing these, due regard is given to the following points in their use:

1—Cut down and make uniform the time of the repair operations.

2—Tool to stand up under severe usage for the greatest possible time. (High grade steels and heat treatments are used where it will prolong the life of the tool.)

3—Initial cost (all special tools are made in our Spare Parts Shops which are run by the Service Department and all tools are furnished to dealers at our actual cost of manufacture).

4—If a tool is an assembly, have the part that will give way first easily and economically replaceable. (A good example of this is a universal wrench. These are made with the pin the hardest part. These pins are made sufficiently strong to withstand hard usage, but in case of undue stress or wearing out, the pins will take the wear, giving way first and are readily replaced.)

5—Tool to be easily kept in order and made in such a manner that it will not rust or deteriorate when not in use. (For instance, special socket wrenches are given a rough polish so as to clean them and are then made rustproof by zinc plating.)

6—Have the tool finished in such a manner that the repair man will treat the tool as a tool and not as a piece of scrap iron. (There is no need of putting an extra expense in getting a high polish or to nickel plate the tools so that they could be placed in a show case, but they should be made up in a workmanlike manner throughout.)

7—Tools are designed to be used on as many models as possible so as to keep the number of special tools at a minimum, providing such design does not complicate the tool.

To get these tools ready for the dealer, they are first drawn up by a draftsman from a layout made by the equipment designer, then checked by the spare parts department for suggested changes to facilitate manufacture and an estimate of the cost made. Sample tools are then made and placed in the hands of the local service department to try out.

After acceptance they are made up in sufficient quantity and placed in stock the same as repair parts. As soon as there are sufficient in stock, there is a notice to all dealers, giving photographs and description of the tool.

This manner of handling special tool equipment was inaugurated ten months ago and we find it takes considerably longer to get the tools out when handled in this manner, but the results more than compensate for the additional time and expense.

It has never been found necessary to urge a dealer to buy such tools, in fact they sometimes become impatient because they cannot obtain the equipment earlier.

The complete set of Franklin special tools will total about twenty pieces, including the following:—

- 2 universal wrenches.
- 1 special socket wrench.
- 1 special open end wrench.
- 1 valve reseating tool.
- 1 valve guide reamer.
- 1 rear axle bearing retainer wrench.
- 1 rear wheel puller.
- 1 spring pivot bolt adjusting wrench.
- 1 crankshaft nut wrench.
- 2 cylinder indicator ring gages.
- 1 connecting rod reaming fixture.
- 1 transmission aligner.
- 1 base bearing reaming fixture.
- 1 running in stand.
- 1 rear axle drive shaft nut wrench.

It is taking eighteen months to get these out and the tool designer will, when this work is completed, spend his entire time in making improvements on his present design and instructing dealers in the use of these tools.

HOW TO WRITE SALES LETTERS

Creating Desire

The same fundamental principles that apply to successful salesmanship are likewise applicable to sales letters. In planning a letter or set of sales efforts in the form of letters, it is always well to keep in mind these fundamental principles which may be classed as follows:

- 1—Attract Attention
- 2—Arouse Interest
- 3—CREATE DESIRE
- 4—Stimulate Action

Each one of these elements should follow in logical sequence and, if properly handled, should produce the desired effect.

BY J. R. HANNON

THE only way we can hope to keep up the interest we have already secured from our reader is to continue to give him information that will be interesting.

How shall we do this? Let's study ourselves a moment and see why, after we become interested in a thing, we want to know more about it. Let's cite a concrete example: Assume we are racing fans. Our interest is aroused when someone mentions the names of De Palma, Chevrolet or Milton and when we're told some intimate facts about them we gladly listen. It's the same way with our letter. After we've got the reader on common ground and interest is shown, we create desire by simply leading him on.

There are a number of ways of creating desire—by argument and proof—by persuasion, and inducement.

A letter may or may not contain all three methods but it's certain that it will have one at least.

The Argument and Proof method must naturally have a logical and sound argument. The proof must be conclusive. A letter creating desire through this method contains hard, cold facts presented so the reader accepts them without question.

Care should be taken so that our arguments will not sound "too good to be true" lest they bring suspicion, no matter how truthful they are. By this, we don't mean to infer that truth will cast suspicion but, rather, to bring home the fact that the average reader is quick to detect unusual claims and it's better to always modify our statements or assertions in such a way that they may be accepted without question.

TOO many writers claim everything for their product, even though it's expected that there's always room for improvement, be this improvement made a year or ten years later.

Dwell upon a few good facts and leave it to your good reader to give you credit for a lot more.

Put your argument across in such a way that will tend to bring some advantage to the reader.

For example, read this:

"The ——— Carbureter pays for itself by reducing gasoline bills. It will not only burn present day fuel but is guaranteed to increase your present mileage from 40 to 60 per cent. The ——— Carbureter once installed is soon forgotten. Why? Because it has no adjustments to fumble with. It works automatically year in and year out."

This argument not only shows the reader certain advantages he will receive

by buying this carbureter but it is backed up by a guarantee.

Suppose we used the following argument instead:

"We have the best carbureter manufactured. Our factory occupies more space and employs more skilled labor than any other carbureter maker in the world. Our carbureter will outlast them all."

"Bushwa," "Bunk," is immediately stamped on such a communication. Even though all the claims are true, one don't gain much by believing them. Such letters are common even in the days of enlightenment, but Oh! how many find a resting place in the "Willow Morgue!"

USING A LETTER OF ARGUMENT AND PROOF

On the next page is a good example of the argument and proof method. The persuasion method of creating desire is the next to be considered.

This matter of persuasion is a tedious job, one that commands plenty of common sense and courtesy.

It is not our privilege to become unduly familiar offering a prospect suggestions or advice about his own affairs, but a little use of "horse sense" and tact will get us over the top.

How many letters have you seen like the following:

"This is an opportunity of a lifetime—fail to grasp it and regret it ever afterwards."

"Don't overlook this, my friend, it's the one big opportunity of your lifetime."

Oil, Oil, Oil—that's what we always think of when we see this kind of persuasion. Think of all the great opportunities one passes up every day and of many that would be grasped if only their letters would be a little more human.

See how tactfully the writer persuades us to investigate his car:

"Step into the new Jordan and you will experience a rare sensation. The body sides are deep—but not high, because the cushions on Marshall springs are extremely deep and rest almost to the floor."

Here is another example of persuasion that strikes a responsive chord:

"With such a motor car you may drive as fast as you dare, and you experience the sensation of driving within the law—Sit all day at the wheel and you return without fatigue, ready to go again."

You will readily see that the persuasion method skillfully handled is a very powerful one to action.

CREATING DESIRE BY INDUCEMENT

We may argue, prove and persuade but if we don't induce our reader to act we get nowhere. Therefore, inducement is all-important.

Remember that letter you received a little while back that got your attention, interested you, persuaded you but, somehow, made you fail to act? The letter lacked the necessary inducement.

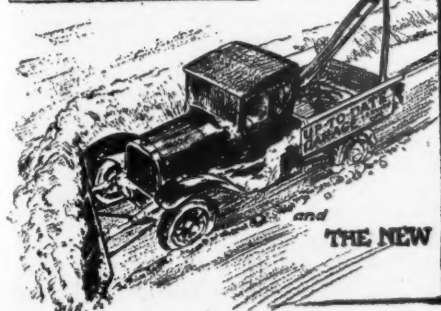
To induce anyone to buy we must offer something that will mean "gain" to the buyer. In other words, he must gain something if he purchases.

The following is an example of a common form of inducement:

"Dealers who investigate this heater will find a selling field limited only by the number of Ford cars in their territories. We stand back of you with this guarantee. If, after 30 days, your customer is not satisfied with it, we will refund the purchase price."

Make sure that whatever the inducement, it is open and aboveboard, something without any strings tied to it. Don't try any clever stunts to trick your prospect into thinking that he is going to get a whole lot more than you're going to give him. This leaves a bad impression and is poor business. Make a straightforward offer, state clearly what you will do so there'll be no chance for a misunderstanding.

THE OLD WAY OF CREAMING WINTER BUSINESS



THE NEW

A Letter of Argument and Proof

Your employee who doesn't work is sooner or later discharged.

The carbureter that doesn't produce should be discarded.

Both the employee and the carbureter are in the same class—neither produces—gives a full measure of service.

It's possible to do away with either and get something better.

A carbureter gives a fair measure of service when it increases mileage, lessens carbon deposits, and permits you to throttle down to two or three miles per hour without any jerking motion. If your carbureter doesn't do this the will and it will do it with the gasoline that is sold now and with which you are familiar.

The carbureter wasn't designed just to increase mileage although this, in itself, is an important factor in these days of high priced gasoline with lower gravity value. The is designed on the principle.

It does not feed the engines with large globules of fuel that retard combustion and acceleration. It DOES completely atomize the fuel it feeds and does NOT permit heavy particles of fuel to accumulate in the combustion chamber and drain down the piston rings into the crankcase. The carbureter is guaranteed to eliminate two evils: The dilution of the crankcase oil and the interference with proper lubrication of the engine, both of which are detrimental and expensive.

The has no adjustments. Once it's put on your car you forget it until you suddenly discover that you never adjust your carbureter any more, that you're getting 40 to 60 per cent more mileage, that you pick up quicker, that you throttle down slower, and that your car, as a whole, is a pleasure to drive.

The above letter can be used as one of a series. Others that follow can dwell on other advantages to be gained—such as concrete examples of how this particular proposition will pay for itself in a short while through the saving effected in fuel consumption alone, time saved by quick starting, etc.

If we may repeat—don't offer any extraneous inducements; your customer is fair-minded and understands that business is business. He doesn't expect a lot of presents any more than you expected a motometer, a book or a time clock when you subscribed to Motor Age.

INTELLIGENT SALESMANSHIP NOW ESSENTIAL

The motor cars and trucks of the country are in use today just as they were last fall. They are wearing out tires, accessories and using up other supplies. What does this mean? It means that the tide of sales, while momentarily stemmed, will be proportionately higher when finally released. When this happens—

and it is beginning to show itself now—don't be caught unprepared and let your share of the business go elsewhere.

Why not begin today to increase your efforts and set a stiff pace for the other fellow? Now is the time to produce. Read, study and do everything that may better fit you for your work. Develop your latent ability. You must do this if you wish to keep pace with the new conditions.

Good sales letters are mighty fine ammunition and your success depends largely upon your ability to surround your proposition with an atmosphere that will put it where your prospects want it—just the way you picture it.

Gaston Chevrolet, Uncrowned Racing King, Dies in Year's Last Race

*Eddie O'Donnell Fatally Injured on Beverly Hills
Speedway—Sarles Wins in Duesenberg*



Gaston Chevrolet

GASTON CHEVROLET broke into racing prominence this year when he won the Indianapolis 500-mile race. He was the junior member of the Chevrolet family and has teamed with his brother Louis and Arthur at the wheel of a Frontenac. Ralph Mulford and Joe Boyer, Jr., have teamed with Gaston at various times also. Chevrolet won third place in the 1917 Memorial Day race at Cincinnati and in 1918 went outlaw along with Barney Oldfield, Earl Cooper and Louis Disbrow, campaigning the western dirt tracks.

He was reinstated in the A. A. A. in 1919 and since then has figured prominently in nearly all of the major racing events of the country. He drove a Monroe Special at Indianapolis this year, where his earnings for the day amounted to \$36,000.

LOS ANGELES, Nov. 26.—An appalling accident at the new board speedway at Beverly Hills Thanksgiving Day snapped out the lives of two participants in the concluding event of the speedway championship events for 1920 and so seriously injured a third that he died the following day in a hospital. Gaston Chevrolet, a driver; Lyall Johls, a mechanic, and Eddie O'Donnell, another driver, are dead as the result of a collision between cars by Chevrolet and O'Donnell, when Chevrolet was in the one hundred and forty-sixth lap and O'Donnell in the one hundred and thirty-eighth lap of the two hundred lap event.

Roscoe Sarles won the contest and \$15,000 by driving without a stop the entire distance. He led in every lap and at no time lost his position for a second. The race was limited to cars of 183 cu. in. piston displacement and was almost

an exclusive Duesenberg contest. Milton, Sarles, O'Donnell, Miller, Thiele and Murphy drove cars of this make and Hearne's car has a similar power plant. The other starters were Thomas and Chevrolet in Frontenacs, Crosby in a Patterson Special and Melcher in a Melcher Special.

Had it not been for the calamitous accident the race, which was witnessed by

SUMMARY

Distance Covered, 250 Mi.
Av.

Driver	Time	m.p.h.
Sarles	2.25.20	103.2
Miller	2.27.14	102.8
Hearne	2.27.27	101.8
Murphy	2.31.41	98.9

Casualties

Dead

Gaston Chevrolet, driver.
Eddie O'Donnell, driver. (Fatally injured, died later.)
Lyall Johls, mechanic for O'Donnell.

Injured

John Bresnahan, slightly, mechanic for Chevrolet.

a throng of 70,000 persons, would have been without a thrill. The regularity of Sarles' driving became monotonous. Milton passed out early with a broken valve and ignition and tire trouble put Murphy far behind. Chevrolet toured at high speed trying to finish in fourth or fifth place. O'Donnell had lost twenty laps by engine trouble and he and Murphy were the only ones putting up much of a battle. Crosby and Melcher were in trouble frequently and the crowd sought amusement in cheering their arrivals at the pits as both were hopelessly outclassed in their mounts.

Gaston Chevrolet, through the outcome of this race, became the uncrowned champion of American speedways for 1920—uncrowned because he did not live to wear the laurels that would have been bestowed upon him. This was the final championship event of the year and Chevrolet needed only to take fifth place to be the king. He entered with a standing of 2,030 points and Milton or Murphy had to win first place to beat him. Milton was eliminated early and Murphy was far behind. Ralph De Palma, who might have given him a



Eddie O'Donnell

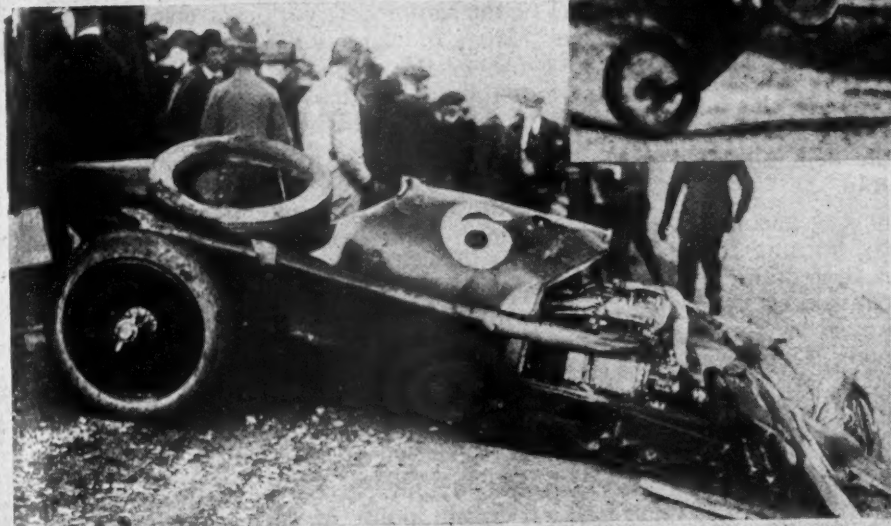
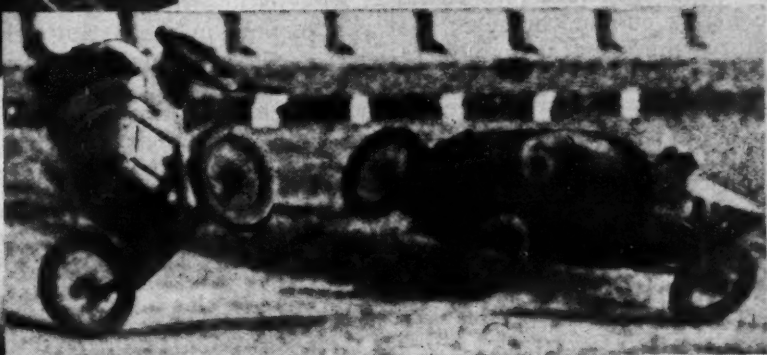
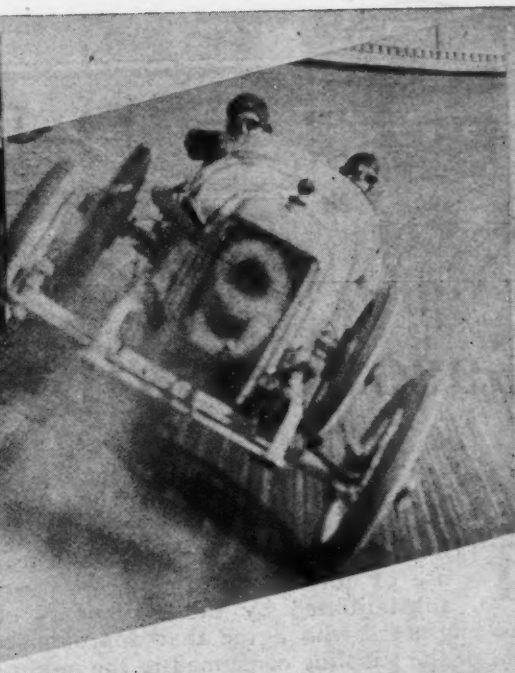
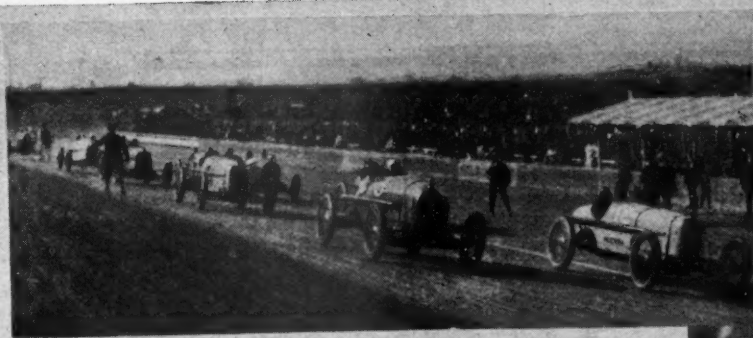
EDDIE O'DONNELL, one time a farm hand hailing from Wisconsin, for years has been associated with the Duesenberg race cars. He was with Fred Duesenberg when the latter first brought out his race creation under the name of Mason Specials. It was in 1916 when O'Donnell put up his stellar performance in racing circles when he was awarded the road race championship.

Although of slight build he possessed the tenacity to withstand the severe punishment inflicted by racing. His knowledge of the internal combustion engine and the ability to interpret race track performance made him a valuable asset to the Duesenberg team. He has teamed at various times with such drivers as Milton, Murphy, Rickenbacher and Henderson and always could be counted upon to hold up his end of the bargain. It is certain his vacancy on the Duesenberg team will be difficult to fill.

struggle, had not entered because his car had not arrived in time. Chevrolet showed no evidence of trying at any time to win this particular race, although he had not stopped until the accident. All he seemed to care for was what he could get without struggling for it and his tragic death did not rob him of the honors. As Milton's total points for the season were 930 and Murphy's 835, victory in the final race carried 500 points, insufficient to make Sarles a contender.

Accounts of the cause of the accident vary. Bresnahan, the mechanic for Chevrolet, says Gaston was passing Thomas on the steeply banked turn and O'Donnell undertook to pass Chevrolet's car high on the bank at the same time.

(Concluded on page 27)



Top: Eddie O'Donnell rounding 35 deg. pitch of upper turn, Los Angeles speedway, where he was killed

Above: Remarkable snapshot of the collision between racing machines 6 and 9 in which Gaston Chevrolet and Mechanic Lyall Johls were killed, and Eddie O'Donnell so badly injured that he lived only a short time

The two pictures at the left show the battered racing machines after the fatal smash-up. O'Donnell's turned upside down, and Chevrolet's with the entire front end crushed in

Upper left: Start of the race. Roscoe Sarles (right) with his mechanic, Ernie Amsterburg, winner of Thanksgiving Day Automobile Classic at Beverly Hills speedway



EDITORIAL



Gasoline is Being Needlessly Wasted

Some Interesting Facts on the Fuel Situation

THAT gasoline is being needlessly wasted in the use of automobiles and motor trucks is well substantiated by the statements of chemists and engineers who agree that approximately 10 per cent of the gasoline consumed in the motor car engine is worse than wasted. This 10 per cent which is not burned or converted into power is what is known as the heavy end of the fuel; that is, the portion that requires the greatest amount of heat to convert from liquid gasoline into a vapor of gasoline and air. This 10 per cent factor enters the combustion chamber not as a vapor but largely as an atomized liquid suspended in the air of the combustion chamber. When the explosion takes place it does not burn, rather it gets onto the cylinder walls and cuts the film of lubricating oil off the walls. This done it passes down past the piston and enters the crankcase where it dilutes the crankcase oil making it necessary to change the oil every 500 miles or thereabouts. This is too extravagant a process for these days when the demand for gasoline is keeping close up on the supply.

It has been pretty definitely agreed among gasoline chemists that the problem of completely burning the present fuel is a greater problem than that of mere carburetion. For many years it was considered that the carbureter had to practically perform every function in connection with the burning of fuel. This does not hold good today. The carbureter is more and more looked upon as a metering or measuring apparatus; that is, it permits a given quantity of gasoline to enter along with a given quantity of air.

It used to be with our lighter gasoline; that is, the grade of gasoline we obtained five or six years ago, that when this proper proportioning of gasoline and air was accomplished the problem was solved. In those days there were no heavy ends, as the gasoline man terms it today. There was no leaking of these heavy ends past the piston into the crankcase. There were no heavy ends to leak. It is these heavy ends that make the problem of carburetion an entirely different one today. The problem is not one of carburetion but one of vaporization.

These heavy fuels have introduced entirely new problems in the motor car engine. The knocking which is so common today is not due to pre-ignition but rather to the explosion in the mixture. It is possible by adding iodine in certain percentage to entirely stamp out this knocking. This knocking is due primarily to the heavy parts of the fuel.

It is possible to reduce this knocking by mixing

benzol with the gasoline. To permanently guard against the present knocking it will either be necessary to change the character of the fuel or to add certain dopes, as they are called, which accomplishes the result, but which are not in commercial production. So serious is this present knocking trouble with the heavier commercial gasoline that no less an authority than C. F. Kettering has stated that if this fuel were used in the present airplane engine it would be impossible to get the airplane off the ground. A special grade of gasoline is required for aviation service.

TO meet the immediate problems of present day fuel in the motor car, various steps will have to be taken. Most of these will merely be temporary ones to get over the difficulty of starting which is more serious this winter than last winter and attended with greater difficulties. There must be a more general use of radiator covers and in many cases covers that will completely cover the bonnet of the car.

There are those who are contemplating purchasing quantities of high-grade gasoline and installing a small gallon tank under the bonnet and using this for starting purposes. There is no doubt but that this would be worth while and prove an economy before the spring. It is a fact that much of the gasoline leaking past the piston and diluting the crankcase oil does this when the engine is cold. The use of a high-grade gasoline for starting would, to a large extent, eliminate this.

The gasoline manufacturers have been constantly increasing the end point of fuel in order to get a greater quantity of gasoline from each gallon of crude oil. Ever since the war we have been using greatly increased quantities of gasoline. For the last ten years consumption has increased 11 per cent per annum, or it has more than doubled in the ten-year period. This has been due to the greatly increased numbers of motor vehicles. Previous and up to 1916 we were always able to produce enough crude oil to furnish the gasoline and kerosene necessary but the demands of the war have made it necessary for us to import crude.

Last year we imported 60 million barrels from Mexico and this year we will import 120 million barrels from the same source. These figures merely indicate what the enormous consumption of gasoline by motor apparatus means. Up to this time the United States has been furnishing 70 per cent of the world's supply of petroleum. We have been using approximately 220 gal. per person each year, whereas the per

capita consumption of the world is but 14 gal. per year. Sane economy of fuel is not only necessary but highly desirable. It is necessary if we are to keep the price from rising and it is desirable in order to conserve our supply, which does not, so far as we know, exist in quantities such as our coal supply.

THE producers of gasoline are becoming more familiar with the burning of it in motor car and truck engines. For many years they thought their problem was merely that of producing a fuel, but now they recognize that the fuel produced must be one that can be efficiently and satisfactorily used in the engines, and that if the fuel is produced and is not efficiently used, then they must have greater regard for the engine.

It is conceded by many that it would be better policy today if 10 per cent of the fuel, that is, the heavy portion, were left out, and if the motorist paid his current price and only got 90 per cent of what he is getting. The 90 per cent purchase would drive his car as many miles and he would not have the unfortunate leaking of the heavy part past the pistons and diluting the crankcase oil.

Much can be done to reduce gasoline consumption by working more with the motorist. There is a demand for good fuel economy contests which will draw attention to more careful adjusting of carbureters; and also to keeping the temperature of the engine higher. There is also a need for keeping the engine speed up as fuels are handled better with a high engine speed than with a low speed.

This brings up the question of more gear-shifting on hills in order to keep the engine speed up rather than reaching the top on slow engine speed on high gear. Every dealer and car user must give more attention to burning fuel during the coming winter than he has heretofore. The problem is a harder one. The price of fuel is higher, and the general economy of fuel makes such a program necessary.



FOR THE GOOD OF AN INDUSTRY

WE learn through sacrifices. Progress has in its wake the milestones of sacrifices in the form of time, labor, energy, and the supreme sacrifice—life itself.

When the curtain fell on the Thanksgiving Day race at Los Angeles, two

lives had been sacrificed and the third a day later. Sacrificed, for what? For the sport of racing, or the thrill which comes from rushing through space at dizzy paces behind powerful engines? No.

These lives have been sacrificed that your car and your neighbor's car will be better cars next year. It is easy to say these men foolishly take their lives into their hands and that they might better turn their efforts into the experimental or engineering rooms of our factories. But, does it ever occur to non-exponents of automobile racing that the speedways and road races are the great laboratories wherein in a day, sometimes, intricate problems involving design and construction of automobiles are solved?

The industry learns through racing. What we see on the race track today we shall find in our cars of tomorrow. You may condemn racing, but the chances are the steels used in your automobile are a result of

what has been found out on the race track. Your tires wear better. Why? Because racing has taught us how to build better tires. And so we might go on.

The racing laboratory needs capable men. Men who can interpret correctly the results obtained in a race. Such men were Gaston Chevrolet and Eddie O'Donnell, the men who made the supreme sacrifice last Thursday. It is certain many of the recent developments made in high-speed, high-efficiency engines have resulted from what these men contributed from their knowledge gained from the outdoor laboratory—automobile racing.



LIGHTING AND EFFICIENCY

INEFFICIENCY must be replaced by efficiency if the progressive dealer of the future will succeed, and one of the surest means to eliminate inefficient methods is through the effective use of illumination. The day is done

when buildings are built with all solid walls and roofs and no windows. Production managers of large factories demand the latest in illuminating devices that their men may work to full capacity and further, windows are demanded in place of blank brick walls.

It is strange to note how an organization housed for several decades under one roof will in its new building have so many wrinkles different from the out of date and antiquated construction in the old building. One of the most apparent differences is the great area devoted to windows. Often times new factory buildings are seen in which the total wall area is of glass except for the supporting columns which constitute but a small portion of the whole.

In the artificial illumination of a dealer's building the two predominating departments, sales and service, must receive individual attention. The sales room illumination is a study in art. The service room illumination is a study in utility. The outlay in the former should be somewhat proportionate to the outlay for the decorative scheme of the whole sales room. The expense involved for the fixtures in the service department need be but a small item.



DON'T NEGLECT HIGHWAY MAINTENANCE

THE promise of better highways to be built by the County, State, or United States has resulted in neglect of the highways now in existence. In many sections of the

country, the roads have been run down to an almost impassable condition. The blame has been placed on the heavily loaded trucks and in a certain measure they are to blame. If the roads were properly taken care of there would be no impassable condition of the average highway regardless of the loads the trucks were carrying. When roads are first built they are in excellent condition. Why not keep them that way? Investigation shows that if a good gravel road is scraped and dragged regularly, it will remain in excellent condition regardless of the amount of traffic.

Amount of Gasoline Shipped Abroad Shows High Increase

Gallons on Hand More Than in
1918 but Less Than
Last Year

WASHINGTON, Nov. 26—Comparative analysis of production and consumption of gasoline for the first nine months of 1918, 1919 and 1920 as compiled by the Bureau of Mines shows evidence of improvement in the gasoline situation. Despite the heavy increases in domestic consumption and the export trade, the stocks on hand Sept. 30, 1920, were considerably larger than in the corresponding period in 1919 but less than last year. The refiners produced a daily average of 15,129,370 gallons of gasoline during September this year as against 11,319,419 gallons during the same period in 1919.

The refineries reported 288,195,394 gallons of gasoline on hand Sept. 30 as against 269,772,723 in 1918 and 371,125,419 in September, 1919. During the first nine months ended September 30, 1920, domestic consumption of gasoline amounted to 3,211,275,983 gallons, a noteworthy increase over the corresponding period last year when domestic consumption aggregated 2,574,541,261. These figures reflect, of course, the increased use of internal combustion engines. Exports showed a high percentage of increase as 465,439,992 gallons were shipped abroad since January as compared with 268,166,964 gallons for the nine months in 1919. The foreign trade for this year exceeded 1918, regarded as the banner year because of the use of automotive equipment incident to warfare. Shipments to insular possessions for the first nine months this year amounted to 16,312,386 gallons and 12,889,050 gallons of gasoline in the same period last year.

Consumption of lubricating oils since January amounted to 477,340,535 gallons as against 389,636,571 gallons last year. The total stocks of lubricating oil on hand September 30 was 130,449,829 gallons. This figure represents a sharp reduction in reserves for in September, 1919, there were 158,967,070 gallons of lubricating oil in stocks. The fact that there has been but little increase in the daily average production for three years easily accounts for this slump.

NEW HOLMES DISTRIBUTOR

St. Louis, Nov. 26—Holmes Motors, Inc., has been organized to take over the distribution of the Holmes car in St. Louis, succeeding the Franklin Auto and Supply Co., Dr. Sebastian Klein retiring.

EX-SERVICE MEN TO HANDLE SHOW

New London, Conn., Nov. 26—The New Bedford (Mass.) Automobile Show, for years prior to the war an automotive event for eastern and southeastern Massachusetts, is to be resumed now that former committeemen have largely returned from army and navy service. It

has been decided to hold it at the New Bedford state armory from Jan. 25 to Jan. 29. Announcement of plans followed a lengthy meeting, the views of the various dealers and other automotive men hastening the setting of a date and the making of other plans. Capt. John A. Stitt is again to serve as president, Lieut. John S. Silvia, secretary, and Lieut. Homer J. Parent, treasurer. Stephen D. Peirce will again be active manager.

Perhaps Your Farmers Can Also Use Trac- tors With Sleighs

DETROIT, Nov. 26—The march of progress has foredoomed the time honored reindeer as well as old Dobbin and the up-to-date sled today is being whisked across the snow by tractor. What more fitting than that Michigan—the home of the automobile—should blaze the trail in up to the minute locomotion.

At Thompkinsville, Mich., this week two sleighs were hooked behind a tractor and twenty-two persons were driven to the home of H. J. Elsie to help him celebrate his appointment as deputy game warden in the upper part of the state where big game abounds. Success of the venture marked the beginning of the end of the reign of the horse in the snow country and many inquiries from farmers in that section are being received at the Fordson and other plants throughout the state with regard to the adoption of the tractor for hauling farm products in sleighs and sleds.

AMERICAN CHAIN TO MAKE BUMPER

New York, Nov. 26—The American Chain Co., which manufactures Weed chains for automobiles and a wide variety of other types of chains, is about to manufacture a bumper. The bumper was shown for the first time at the exhibit of the Automotive Equipment Association in Chicago.

RECEIVER FOR HEBB MOTORS

Lincoln, Neb., Nov. 26—Federal Judge T. C. Munger has appointed Joseph E. Rosenfeld of Omaha receiver of the property of the Hebb Motors Co. and the Patriot Motors Co. The bond of Mr. Rosenfeld was fixed at \$50,000. The receiver was appointed on application of creditors. The Patriot Motors Co., successors to the Hebb Motors Co., which has been operating a large truck factory at Havelock, had issued a call for a meeting of their creditors to be held at Chicago Nov. 22, to consider some plan to conserve its assets. This meeting was called off since action was begun in court.

Companies Say Price of Gas in California Will Be Increased

Have Refused to Renew Contracts at
Prevailing Rates—Middle West
Importations Cease

SACRAMENTO, Calif., Nov. 26—Now again comes the bugbear of an increased price in gasoline to intimidate the prospective automobile purchaser and to discourage the person who already owns a car. Recently the San Francisco Chamber of Commerce made a survey of the oilfields in California, and reported the supply cannot equal the demand made by this motoring state.

Immediately following, and in the face of a price reduction of a cent a gallon in the East, the four big companies, Standard, Shell, Associated and Union, announced prices were likely to increase and have refused to renew contracts at prevailing prices. Gasoline now sells for 27 cents in San Francisco and 27½ here. Fuel oil is \$2.35 in San Francisco, and 10 cents higher here.

Refuse Oil for Heating

Big users of fuel oil are being refused renewals of contracts and apartment houses built for oil heating apparatus will be left in the cold, the companies declare.

When prices in California were boosted liberally last spring and summer, it was declared by the oil companies the reason was the importation of gasoline from the Middle West. Some importations were made, but it is declared they ceased almost immediately. Nevertheless the price remains at 27½ cents, having come up from 21.

Creditors Oppose Declaring Ericsson Company Bankrupt

New York, Dec. 1—Merchandise creditors of the Ericsson Manufacturing Co. of Buffalo, manufacturers of the Berling magneto and other automotive appliances, decided at a meeting here a few days ago to make a determined stand against having the corporation declared bankrupt. They contend that it is solvent and that the interests of the unsecured creditors, whose claims aggregate \$365,000, would be sacrificed by bankruptcy proceedings.

The company was thrown into receivership a fortnight ago by the Swedish Ericsson Co., which is said to own a controlling interest in the Buffalo concern. William A. MacDougal and Robert E. Powers were named as receivers by Federal Judge Hazel. This action was followed by the filing of an involuntary bankruptcy petition by three Buffalo creditors whose claims aggregate \$3000. The petition alleges the company committed acts of bankruptcy by making a general assignment of assets for the benefit of the City Trust branch of the Marine Trust Co. It is charged that the assets were transferred with "intent to hinder and delay creditors."

Louisiana Offers Fields of Rice Straw for Making Gas

Interested in Experiments Being Conducted in Kansas with View to Converting Strawstacks

NEW ORLEANS, Nov. 29—Louisiana is particularly interested in experiments now being conducted with a view to converting the farm strawstack into a fuel gas. While the straw stock is supposed to blossom most luxuriously in Kansas, there are about 4,000 sq. mi. of thick-grown wild-rice straw going to waste every year on the Louisiana marshes.

Technically, the cereal in question is not a rice at all, but a form of wild barley. The yield of this straw to the acre is somewhat heavier than that of wheat or barley, and the land on which it grows in Louisiana is flooded mudflat, useless for anything else, so that if this straw can be made to produce approximately \$12 an acre in fuel gas, as Kansas chemists have announced, there is some \$30,720,000 worth of gas going to waste every year on the marshes of southern Louisiana, enough to drive all the automobiles in the United States for some time, even at the present price of gasoline. So far, no other use ever has been found for this straw.

This "wild rice" grows so densely that a man scarcely is able to push his way through it, and travel over this section of marsh has to be in a pirogue or a john-boat following the many small, shallow waterways which cut it here and there. The straw is three to four or five feet in height, topped with heads similar to those of rice, whence the common name.

Bloomington, Ill., Nov. 26—Manufacture of benzo as a substitute for gasoline as a motor vehicle fuel may shortly become a reality at the distilleries of central Illinois. Experiments which have been conducted for some time are now said to have reached a successful conclusion, and the high cost of production is now all that is in the way of manufacture.

Connecticut Is Prepared to Keep Roads Free from Snow

Hartford, Conn., Nov. 26—The Berlin turnpike, the remaining link to be improved on the New York-Boston road via Hartford has been completed by the highway department and opened to public travel. The highway which extends from Hartford to Berlin is considerably wider than the original road banked on the turns and will be of much benefit not only to passenger traffic but to truck traffic as well. This is one of the busiest thoroughfares in the state and was constructed with the idea of sustaining heavy truck traffic, concrete being the material used. The department is also rushing work on the concrete link from Berlin

to East Berlin which cleans up one of the worst roads in the state.

The state highway department is fully prepared to keep the roads free from snow this winter and unless the elements let loose to the tune of numerous blizzards truck and passenger travel will not be interfered with in the least so far as the main trunk lines are concerned. The state highway department has over a hundred trucks throughout the commonwealth and the necessary appliances for clearing the roads of snow. Last winter was a hard proposition by reason of one snow storm being closely followed by rain which froze, making removal of the snow practically impossible.

Gas Dealer Places Blame for Quality and Price on Refiner

Rochester, Nov. 27—Blame for prices and quality of gasoline should be placed on the refiners who furnish it to the distributors, was the declaration of J. Lawrence Hill, a member of the Rochester Gasoline Dealers' Association. He said that dealers are unable to obtain redress for complaints that have been made against them.

"We particularly resent the insinuation that our members are profiteering," Mr. Hill said. "The cost from the Standard Oil Co. is 32 cents, leaving a margin of 4 cents per gallon for rent, electricity, telephone, stationery, help, interest on investments and many smaller items which are too numerous to mention."

The original accusation arose over a specific case where a test was made of gasoline that was being sold by one dealer. Chemical analysis proved that the specific quality of the gasoline was 57 per cent. The chemist who made the analysis is quoted as saying the gasoline was poor, but not much worse than the gasoline sold at other stations in Rochester. The chemist is also alleged to have stated that cases have been discovered where owners of gasoline stations have mixed gasoline with kerosene oil.

FLAHERTY HEADS ROAD BUILDERS

New York, Nov. 26—M. A. Flaherty, chairman of the Chicago Board of Local Improvement, has been elected president of the American Road Builders Association. He has been active in the promoting of good roads in Illinois which has a \$60,000,000 issue of road bonds in reserve to be spent in the next few years in completing the state system. Speakers at the meeting here at which Flaherty was elected told of the urgent need for research in highway work and advocated that more money be spent in building road foundations.

RECEIVER FOR ROCHESTER FIRM

Rochester, N. Y., Nov. 29—The Rochester Car Sales & Service Co. has filed a petition of bankruptcy with the United States District Court in Buffalo. The petition is signed by Gay S. Clappitt, as president of the concern. Federal Judge John R. Hazel has appointed Edward P. Vollertson receiver.

Low Cotton Price Continues Factor in Retarding of Sales

Spirit of Confidence Prevails with Expectation of Improvement Shortly After Holidays

ATLANTA, Ga., Nov. 29—A survey of economic conditions in the South reflecting the views of leaders in finance, commerce and industry, emphasizes a predominant spirit of confidence and faith in the future, according to Governor M. H. Wellborn, of the Federal Reserve Bank, following the receipt of replies to a large number of letters he had sent to prominent southern business men all over the sixth reserve district inquiring as to general trade conditions and the outlook for the future. These letters were sent to leading bankers, wholesalers, exporters and distributors representing numerous lines of business and industry. The district includes Georgia, Alabama, Mississippi, Louisiana, Florida and Tennessee.

Low Cotton Price Halts Demand

Mainly on account of the low price of cotton, which failed to continue the upward climb it started a few weeks ago, automobile dealers in the smaller towns are experiencing very little demand and business is only a little better in the larger cities. However, the dealers and distributors still express extreme confidence as regards the future, most of them feeling that after the first of the year their business will begin to get back to a normal basis.

George W. Hanson, president of the Hanson Motor Co., of Atlanta, stated that while dealers were making very few sales right now, general conditions indicate the industry will "Get Back to Business" again very shortly after the holidays.

Deny that Wages Were Lowered When Overland Reopened Plant

Detroit, Nov. 26—Vigorous denial that wages were cut at the Overland plant when 2,000 men were taken back with the reopening of the parts department, was made by Vice-President Kilpatrick in charge of production. All of the men were taken back at their old wages, he said. Mr. Kilpatrick added that much was being done to the detriment of the industry by the circulation of such reports and he added that wage conditions in Toledo did not warrant a reduction of any sort when the men were taken back.

Resumption of operations in the parts department of the plant disposes of rumors, denied vigorously by Vice-President C. A. Earl, that the plant would be down indefinitely and other rumors involving abandonment of Overland 4 or substitution of the old model. Other departments of the plant will reopen as rapidly as inventories are completed, according to Mr. Kilpatrick and resumption in full is expected early in December.

Closer Inspection Before Cars Leave Factory Will Aid Dealer

S. A. E. Speaker Takes Up Question of Misplaced Parts and Missing Details

PHILADELPHIA, Nov. 26—The Pennsylvania section of the Society of Automotive Engineers was told by W. H. Metcalfe, manager of the local branch of the Wire Wheel Corp. of America, what the automotive engineer can do to assist the dealer and owner.

He called attention to the fact that automobile salesmen not only believe in but like to boast about the efficiency of the corps of engineers of their particular factory and usually make this a strong selling point.

"It is absolutely essential," he said, "that you should insist on proper factory inspection. For instance, all cotter pins should be placed where you have designated them to be and lock washers should be in place and not forgotten."

He stressed the annoyance caused the dealer who found that these parts were misplaced when cars he ordered had arrived.

Should Leave Factory O. K.

"The changing of the size of spindles, bearings and axles on a current model works a very great hardship on the dealer," he said. "This is in the case where it has been shown at the factory that the model has not stood up well under a smaller sized spindle and that for eastern hilly country it will require a heavier one. Then this is changed in the same model and when it arrives the dealer has no parts to replace the changed size. In such a case the engineering department should have secured through tests the right size spindles, bearings and axles before permitting the car to be sold. Why should a dealer be compelled to carry three or four different sets of parts for one model of car?" He suggested that the way to obviate the necessity of carrying too many parts was to standardize them.

Taking up further the necessity for proper inspection, Mr. Metcalfe said that dealers have much trouble over improperly inspected vehicles arriving from the factory sometimes minus vital details.

Inspection should be done at the factories and not by the dealer after the car reaches him.

INCORPORATE R. & V. MOTOR CO.

East Moline, Ill., Nov. 26—Charter was granted today to the R. & V. Motor Co. to manufacture engines and capital stock of \$6,500,000 was authorized by the secretary of state.

This incorporation, it is understood, will operate the automobile business of the Root & VanderVoort company upon the reorganization which will follow separation of the plant through plans with the Moline Plow company, now under way. H. A. Holder of Boston is expected

to become vice-president and general manager of the new motor company. G. N. Peek, president of the Moline Plow company, is out of the city, so that no official announcement of the entire significance of the new company is forthcoming from the local offices. Details of the separation are understood to be practically completed. The R. & V. plant, it is rumored, is planning for large output of cars and motors for the spring trade.

Reducing Parts Insofar as It Will Not Lower Cost of Labor

Cleveland, Nov. 27—Manufacturers in this city who have been manufacturing parts for the Ford Motor Co., are making price concessions to enable that firm to meet its price reductions in cars without cutting labor costs. In a few instances the reductions have not been as great as desired by the Ford people.

It was said that Mr. Ford demanded a reduction of 35 to 40 per cent in a part manufactured in Cleveland. Such a cut would obviously mean a cut in wages at the plant making the reduction. This particular manufacturer made a cut of 10 per cent without reducing labor. Another plant reports that it has reduced the unit price of a part for the Ford Motor Co. from 60 cents to 52 cents. This reduction was also made without reducing wages.

Stockholder Asks Receiver Be Named for Templar Motors

Cleveland, Nov. 26—J. W. Wilson of Columbus, a stockholder, has filed suit in common pleas court here in which he asks for the appointment of a receiver for the Templar Motors Co., a \$10,000,000 corporation organized by local people in 1917.

Mr. Wilson charges that the company never has been on a paying basis but has paid eight dividends quarterly from the proceeds of the sale of stock. He complains that officers of the corporation profited excessively in brokerage fees from the sale of stock.

M. F. Bramley, Templar president, says that the company has \$8,000,000 assets; outstanding indebtedness is \$600,000; finished cars on hand worth \$1,000,000, and that the action is filed to injure the company's reputation.

SALES COMPANY FOR A. B. C.

Chicago, Nov. 26—The Anheuser-Busch Sales Corp., St. Louis, Mo., has taken over the sales and manufacture of the A. B. C. transfer refrigerating system as applied to motor trucks and has opened a sales office in this city. The A. B. C. Refrigeration Co., Chicago, will continue the manufacture and sale of the system railways and steamships.

Heretofore the truck bodies carrying the system have been built by different manufacturers. Through the change in handling there will be a centralization of this effort. The system can be bought from the corporation separately or with truck bodies.

Must Study Individual Needs of Customer in Truck Selling

Spindles as Sole Method of Book-keeping Method Cause of Failure, Speaker Tells Association

PHILADELPHIA, Nov. 26—The first official assurance that the trade in this district has had of the attitude of the Federal Reserve system toward the motor truck industry was given by William H. Hutt, deputy governor of the Federal Reserve Bank, Philadelphia, before the Motor Truck Association of this city. Applause and cheers from the 106 members who heard him greeted his announcement that at no time has the Federal Reserve system placed unfair restrictions against motor truck manufacturers and dealers.

"Motor truck men have not been to see us to discuss this general financial situation," he said, "but the representatives of several large organizations have come to see us because they were under the impression, or had been informed, that the Federal Reserve banks had placed unfair restrictions against the motor truck manufacturers and dealers."

"Their belief that the Federal Reserve system was so functioning was based entirely upon unfounded reports to the effect that we were undertaking to draw sharp lines between various classes of businesses in order that banking credit might only be used by such industries as we considered essential and I was glad to inform these gentlemen in every instance that no such lines had been drawn."

Know Transportation Needs

William Elliott of the Packard Motor Car Co. of New York told the members that "We must analyze credits more intelligently. We must analyze the transportation needs of the industries around us in which there are certain variations. In our capacity as salesmen we must be prepared to give our best efforts and must sell to the customer only that truck which we know is best fitted to his particular needs. We must sympathize with and study the transportation problems of all manner of men."

He predicted that the day of the transportation engineer would soon come, and that it would prove a great stimulus to the sale of trucks.

"As for sales," he said, "you know the hen doesn't stop scratching when the worms are few. She keeps right on. I believe we have about reached bottom in the industry and that now we are about to come up on the other side."

Lewis A. Smith, superintendent of the Philadelphia branch of Bradstreet's, in speaking on "Why Men Fail" said that 90 per cent of the small tradesmen keep no books at all and their office system often consists of but two spindles, one for debit and the other for credit. They go on in this way until suddenly they awaken to the fact that they are bankrupt.

General Motors Passes Under Control of Morgan and du Pont

W. C. Durant Sells Speculative Holdings—His Services Probably Will Be Retained

NEW YORK, Nov. 26.—Through the purchase of the speculative holdings of W. C. Durant, the du Ponts and J. P. Morgan & Co. have acquired control of the General Motors Corp., which next to United States Steel, also under the domination of the Morgan interests, is the most colossal industrial enterprise in America. This acquisition was not entirely unexpected to those who had followed the affairs of the company closely. The du Ponts have been the largest individual stockholders since 1918, but their alliance with the house of Morgan began only last June. The combined interests now own more than 50 per cent of the "billion dollar a year" company.

No general shakeup in the general organization of General Motors or in its various divisions is expected. Mr. Durant doubtless will become chairman of the board and assume a position analogous with that of Judge Gary in United States Steel. No further expansion is looked for in the near future, although the abundance of capital now back of the corporation would make it possible to take over well-established concerns which may be in temporary financial difficulties. The possibilities before the powerful group which controls the greatest combination in the automobile industry are limitless.

Mr. Durant began his career with nerve, brains, imagination and a genius for financial organization. He and Henry Ford are regarded to-day as the master wizards of the industry. He grasped the future of the motor car at a time when most men were laughing at it and the vision he had then, built for him the position he holds to-day. He was not disturbed when others laughed at what they thought his foibles and follies and he has lived to laugh at them.

As an organizer he has few peers and his mastery of details is astounding. No man in his organization works harder than he, notwithstanding the fortune he has amassed. He is an optimist and a constructionist. He saw readjustment coming and prepared his company for it so far as that was possible, but the corporation will be equally ready to grasp the possibilities of the future.

THE FOLLOWING IS A LIST OF UNITS NOW CONTROLLED BY GENERAL MOTORS:

GENERAL MOTORS GROUP:

Buick Motor Div., Flint.
Cadillac Motor Car Div., Detroit.
General Motors Truck Div., Pontiac.
Oakland Motor Car Div., Pontiac.
Olds Motor Works Div., Lansing.
Scripps-Booth Corp., Detroit.
Sheridan Motor Car Co., Muncie.

CHEVROLET GROUP:

Chevrolet Motor Co. of Mich., Flint.
Chevrolet Motor Co. of N. Y., Tarrytown.
Chevrolet Motor Co. of St. Louis, St. Louis.
Chevrolet Motor Co. of Texas, Ft. Worth.
Toledo Chevrolet Motor Co., Toledo.
Chevrolet Motor Co. of Bay City, Bay City.

Chevrolet Motor Co. of Kansas City, Kansas City.

Chevrolet Motor Co. of Atlanta, Atlanta.
Chevrolet Motor Co. of Minn., Minnesota.
Chevrolet Motor Co. of Cal., California.

GENERAL MOTORS OF CANADA, LTD.:

Canadian Products, Ltd., Div., Walkersville.
Chevrolet Motor Co. of Canada Div., Oshawa.
McLaughlin Motor Car Div., Oshawa.
Olds Motor Works of Canada Div., Oshawa.

TRACTORS AND IMPLEMENTS:

Samson Tractor Div., Janesville.
Samson Tractor Co. of Cal., Stockton.

ACCESSORIES:

UNITED MOTORS GROUP:

Buffalo Metal Goods Co., Buffalo.
Dayton Eng. Laboratories Co., Dayton.
Harrison Radiator Corp., Lockport.
Hyatt Roller Bearing Div., Newark.
Jaxon Steel Products Div., Jackson.
Klaxon Co., Newark.
Lancaster Steel Products Corp., Lancaster.
Remy Electric Div., Anderson.

MISCELLANEOUS:

Champion Ignition Co., Flint.
Dayton-Wright Co., Dayton.
Delco-Light Co., Dayton.
Frigidaire Corp., Detroit.
General Motors (Europe), Ltd., London.
General Motors Export Co., New York.
Sunnyhome Electric Co., Detroit.

CENTRAL PRODUCTS DIVISION:

Central Axle Div., Detroit.
Central Forge Div., Detroit.
Central Gear Div., Detroit.
Northway Motor & Mfg. Div., Detroit.

MUNCIE PRODUCTS DIVISION:

Muncie Parts Div., Muncie.
T. W. Warner Plant, Muncie.

SAGINAW PRODUCTS DIVISION:

Central Foundry Div., Saginaw.
Central Motor Div., Saginaw.
Jackson-Church-Wilson Div., Saginaw.
Saginaw Malleable Iron Co., Saginaw.

GENERAL:

Michigan Crank Shaft Div., Lansing.
St. Louis Mfg. Corp., St. Louis.
Dayton Metal Products Co., Dayton.
Domestic Engineering Co., Dayton.
Doylestown Agricultural Co., Doylestown.
Fisher Body Corp., Detroit.
General Motors Acceptance Corp., New York.
Industrial Terminal Corp., Detroit.
Janesville Machine Co., Janesville.
Lancaster Steel Products Corp., Lancaster.
Bearings Service Co., Detroit.
Brown-Lipe Chapin Co., Syracuse.
Doehler Die Casting Co., Brooklyn.
Durant Building Corp., Detroit.
Flint Varnish & Color Works, Flint, Mich.
Independent Lamp & Wire Co., Weehawen.
Consumers Power Co., Durant Hotel Co.,
House Financing Corp., Hyatt, Ltd., Lansing.
Home Building Co., Modern Housing Corp.,
Novelty Incandescent Lamp Co., Wisconsin River
Power Co.

Majority of Claims Against King Motor Company Bought

Detroit, Nov. 29.—C. A. Finnegan, head of the Susquehanna Holding Co., Buffalo, has purchased the majority, in number and amount, of claims, against the King Motor Car Co. and plans to purchase the assets of the company with the expectation of operating it as a going concern in the old plant of the Swedish Crucible Co. Under the plan Mr. Finnegan will place a Weber official of the Buffalo company in charge.

The claim of Artemas Ward, Sr., was bought by Mr. Finnegan at 33-1-3 per cent and other creditors' claims were purchased for amounts varying up to 40. The return date of the receivership petition is tomorrow and representatives of Mr. Finnegan announce he will be here and advise the court that he now is the majority creditor and seeks control of the company through the purchase of assets. H. L. Crusoe, agent for the Detroit Trust Co., receiver, said today that the receiver's sale would be held within fifteen days at which Mr. Finnegan and several others would bid on the property.

New Financing and Increased Production Put Off by Packard

Company to Minimize Capital Requirements Which Fluctuate with Rate of Manufacture

DETROIT, Nov. 26.—A great increase in branch inventories, especially in the item of finished vehicles on hand, is noted by Alven Macauley, president of the Packard Motor Car Co. in a report to the stockholders. It is pointed out, however, that an increasing proportion of the company's distribution is through its own branches and now reaches nearly 50 per cent of production, including the export business. Complete vehicles on hand at the factory are valued at \$8,145,208 which equals approximately one-tenth of the total shipments for the year ending Aug. 31.

In the fiscal year which ended Aug. 31 the Packard company manufactured 7,667 passenger cars and 7,445 trucks, a total of 15,112. Export sales for the year amounted to \$4,220,758 and comprise 618 passenger cars and 541 trucks.

Plant expenses during the year amounted to \$6,982,889 of which approximately \$2,000,000 was for machinery. About \$3,000,000 was expended for new tools, one-half for tools used in manufacturing the new Single Six.

President Macauley points out that in view of the falling off in business and the high money rates prevailing the directors have decided not to proceed with the new financing discussed at a special stockholders meeting held on May 24, last, until it shall be more immediately needed. It has been determined instead to postpone all plans for increased production and thereby to minimize capital requirements which naturally fluctuate more or less directly with the volume of production.

FIVE OSHKOSH TRUCKS DAILY

Oshkosh, Wis., Nov. 26.—Business with the Oshkosh Motor Truck Co. for the last three weeks has been better than at any time during the last three months, according to Sales Manager Homer Hilton. The company will move into a new plant next month which will give it a possible production of five a day, as compared to the present limit of one a day.

COMPILING TIRE STATISTICS

New York, Nov. 26.—The Rubber Association of America has undertaken the gathering of monthly statistics from individual tire manufacturers who are members of the Tire Manufacturers division, relative to the inventories, production and shipments of pneumatic and solid tires and inner tubes, as well as the amount of cotton fabric and crude rubber consumed. The association will supply each member participating in the arrangement with the totals compiled from the individual returns. A report of total inventories, production and shipments as of November 30 probably will be available early in December.

Quick Sales Result of First Closed Car Salon in Capital

Show Organized Within Two Weeks Also Develops Large List of Prospects

WASHINGTON, Nov. 26—Dealers who participated in Washington's first closed car salon agreed that the outstanding feature of the exhibition was the revival of buying. Exhibitors anticipate that the beneficial effects will extend over a long period through a stimulation of interest in the late models of closed cars.

Several thousand persons attended the exhibition which was staged in the lobby of the new Wardman Park Hotel. Sixty cars were displayed. The simplicity of the hotel settings set off the exhibits to advantage. The show was organized within two weeks and every model displayed was taken from stock. Fortunately there were a few dealers in a position to deliver cars immediately and demands of this kind were frequently reported. The display was valued at \$250,000. Twenty-nine dealers were represented on the floor and six local accessory dealers had attractive exhibits.

Visitors were visibly pleased with the opportunities for comparison allowed at the salon. Salesmen reported large lists of prospects as a result of the inspection. Several exhibitors reported quick sales, some without demonstrations. The success of this initial show was so marked that dealers expect to stage another and larger exhibition next year.

Richards of Chattanooga Holds Election of Officers

Chattanooga, Tenn., Nov. 26—The Richards Motor Co. of this city, distributing Locomobile, Briscoe, Mercer, Malbohm and Sayers has elected the following officers: J. C. Richards, president; D. Minard Shaw, vice-president; Stephen E. Wade, treasurer; Sidney H. Vaught, secretary. E. H. Cornes remains as sales manager and Marshall Kratzer as cashier.

Mr. Shaw is from Detroit and for the last two years has been Nashville manager for the Herff Motor Corp., wholesale distributor for Fiat and Briscoe.

Business in this section of the country is good and indications are that the South will take a lot of closed jobs this year as shown by the number of sales already made and the live prospects on file.

Accessories Association Will Join Better Business Movement

Philadelphia, Nov. 26—At a rousing meeting of the Automobile Accessories Business Association all the officers were re-elected and five directors were chosen. The directorships were hotly contested, there being sixteen entrants on the ballot and only five to elect. The election resulted as follows: President, W. H.

Metcalfe, fourth consecutive term; vice-president, George L. Fischer; treasurer, N. A. Petry, and secretary, A. W. Stellwag. The board of directors includes W. T. Bosworth, George L. Carroll, T. Scott Eavenson, C. H. Vogt and C. Harry Walz.

In speaking of the future of the association, Mr. Metcalfe said that the launching of the membership campaign had started in a gratifying manner, that already there were upwards of 350 members and that under the plan of having each member bring at least one new member into the organization the goal of 800 by the January meeting would be attained. He further stated that the association would ally itself with the Better Business Bureau movement and that it would pay close attention to the revision of unfavorable motor laws in the state.

Addresses were made to the association by F. R. Goodell, second vice-president of the Converse Rubber Shoe Co., of Boston, and Ira W. Barnes, president of the Ninth National Bank of Philadelphia.

Charleston Automotive Trades Choose Officers for Next Year

Charleston, S. C., Nov. 26—At the annual meeting of the Charleston Automotive Trades Association, held at the Charleston Hotel, the following officers were elected for the ensuing year: J. Robertson Paul, president; H. Lee Harvey, first vice-president; T. F. Roberts, second vice-president; E. F. Ostendorf, treasurer; J. Gilmore Smith, secretary; and the following board of directors: Julius H. Jahnz, Marshall Singler, James Sottile, and Leon J. Cosgrove. The retiring president, Santo Sottile, was elected a board member ex-officio.

After the business session an enjoyable dinner was served, and informal talks of interest to the members were made. Charleston members expect to be well represented at the state meeting to be held in Columbia on Dec. 9 and 10.

SINGER MOTOR CO. BANKRUPT

New York, Nov. 26—The Singer Motor Co. of Mt. Vernon, which has been in receivership for some time, has been adjudged bankrupt and its assets will be sold at the plant today. The bankruptcy petition followed vain efforts to settle the company's affairs. The plan which was proposed did not prove satisfactory, but Max Lowenthal, the receiver, is continuing his investigation of the company's affairs.

TRUCKS AT SAN FRANCISCO SHOW

Sacramento, Calif., Nov. 26—The two big automobile shows of the State have announced their dates for 1921. The first show will be the Oakland event, to be held in the Municipal Auditorium Jan. 31 to Feb. 6. The second will be the San Francisco display, in the Civic Auditorium, Feb. 19 to 27. In connection with this will be truck and trailer displays in a huge tent adjoining. The accessories will be shown, as usual, on the upper floors of the Auditorium.

Repair Shops Benefited by Recent War Department Order

Government Will No Longer Undertake Repairs on Any but Official Cars

WASHINGTON, Nov. 26—Orders issued by the War Department will put an end to a practice which interfered with the legitimate functions of private garages and repair shops. The chief of staff issued instructions to the effect that "no privately owned motor vehicle, part, or accessory will be manufactured or repaired by civilian or enlisted personnel of the army at the various repair shops of the quartermaster corps."

With numerous repair shops operated by the quartermaster corps throughout the country, repair jobs which ordinarily would be let to the private garage owner or mechanic found its way into these places where through influence or tips, the work was completed at little or no cost. The thousands of army officers operating their own cars were accustomed to have their repairing placed in these places. The civilians or enlisted men were at a disadvantage and could not protest against this abuse. Garage owners whose business suffered as a result were successful in their complaints as the latest promulgation of the War Department shows.

Whether or not this practice is stamped out depends entirely upon the vigilance exercised by repair-shop owners.

Expect Shortage in Spring Due to Lowered Production

Cleveland, Nov. 26—A distinctly optimistic note is sounded in 90 per cent of the letters reaching the Federal Reserve Bank from automobile distributors, dealers and manufacturers throughout the Fourth district, according to a statement just issued by the bank. There are differences of opinion among men in the industry regarding the probable length of the present readjustment period.

Dealers report they are cleaning their floors in expectation of refilling them. Motor car makers express the opinion that stabilization of prices has been accomplished, at least for the time being, and those who have reduced prices have given assurances to dealers that they will remain fixed until the end of the Spring season of next year. Those who have not reduced have guaranteed present prices until May, June or July. Automobile manufacturers feel that the public will come into the market as soon as convinced of the stability of prices.

The opinion is growing in the trade that there will be a shortage of cars in the Spring by reason of the curtailment that has been made in fall production and the inclination of the dealers and manufacturers to proceed cautiously until the readjustment period is past. The motor truck industry shows a marked decline in activity during the month over the corresponding month of last year.

Industry Pays Large Sum to Railroads for Car Shipments

Freight Bill Aggregates \$100,000,000 a Year — Covered by Finished Products

NEW YORK, Nov. 26—Figures compiled by J. S. Marvin, traffic manager of the National Automobile Chamber of Commerce, indicate that the freight bill paid by the automotive industry to the railroads approximates \$100,000,000 a year.

"Based on the number of carload shipments of completely assembled machines recorded in 1919 and allotting them to the several territories in about the proportion of registration, the estimate indicates a total freight bill of \$56,000,000 Mr. Marvin says. "In addition to this it is believed that not less than \$10,000,000 was paid on carload shipments of parts forwarded from the main automobile plants to branch plants for assembling, which would increase the total to \$66,000,000. Applying the increased freight rates recently authorized by the Interstate Commerce Commission, this sum, it is estimated, will be raised \$22,000,000 on an equal volume of shipments during the ensuing year, or a total of \$88,000,000.

130,000 Delivered by Driveway

"This figure should exceed \$100,000,000 with adequate car supply because in 1919, 130,000 motor vehicles were delivered to buyers over the highways under their own power, to points as far from the factories as 1,000 miles and over. This is equal to 40,000 carloads. But in the first nine months of 1920 so severely did the car shortage strike the motor car industry that 440,730 machines, equal to 130,000 carloads, were delivered to buyers in this manner. Allowing 10 per cent of this quantity as nearby or local deliveries and \$100 per carload as an average freight charge on the remaining 117,000 carloads, the amount of freight revenue lost to the carriers through inability to furnish freight cars during these nine months were nearly \$12,000,000.

"Shipments of finished automobiles and motor trucks from the main plants reach a volume of about 300,000 carloads per year, but according to the freight commodity statistics of the Interstate Commerce Commission this figure, including, however, wheels and parts as well as shipments of motor cars from all sources, will be nearer 500,000 carloads. Since Jan. 1 the Commission has required railroads to report this as one of the principal items of traffic recorded separately. Figures for the first quarter are now available and indicate 126,624 carloads; this does not include unfinished materials. Motor cars move largely in train-load lots from the centers of large production, and loading and unloading of freight cars is accomplished with great rapidity, all of which adds to the attractiveness of this traffic from a railroad viewpoint.

"The earnings shown above, however,

cover only the charges on finished machines and take no account of the immense tonnage in and out of the factories engaged in making tires, engines, frames, bodies and various other parts. In getting their fuel and materials, and shipping their output, these plants require thousands of freight cars each month. The shipping by freight and express of automobile parts and other articles and accessories used by automobilists has reached a tremendous volume."

Crop Statistics Point Way to Obtaining Prospects

SACRAMENTO, Calif., Nov. 26—A new use for government crop statistics and forecasts was told in the annual convention of the California Fruit Growers and Farmers by E. E. Kaufman, statistician in the federal and state co-operative crop reporting service.

"No industry uses the crop reporting service more than the automobile," said Mr. Kaufman in an address before the convention, explaining the work of his service. "Automobile manufacturers follow our crop forecasts carefully, with the evident purpose of placing their cars in proportion to the crop yields.

"The farmer is a large purchaser of automobiles at this time and his ability to buy depends upon his crops, of course. Hence, the automobile manufacturers follow our forecasts and final reports and places most cars where the crops are best."

New Company to Specialize in Body Work for Car Dealer

Detroit, Nov. 26—The Congdon-Russell Co., composed of men widely known in the automotive industry in this section, has been formed to specialize in body work for the automobile dealer and owner. The concern is capitalized at \$250,000 and the directors are A. S. Congdon, J. W. Russell, C. H. Guider, George W. Muehl and J. J. Jacobson.

Mr. Muehl formerly was connected with the Cadillac branch and will have charge of the credit and finance departments of the new company. Mr. Guider, formerly of Erdman-Guider, will have charge of sales and estimates, and Messrs. Congdon and Russell will have charge of production. The two latter for years have maintained a trimming and painting business in Detroit. The concern has started operations. A chauffeur service, either in livery or civilian clothes, will be included in the service offered to the public.

Dealers in California Find Buyers Among Grape Growers

Prepared for Rice Harvest to Obtain Prospects but Heavy Rains Caused Disappointment

SACRAMENTO, Calif., Nov. 26—While the new car market in the Sacramento valley has shown a decidedly sluggish tone in the past few months, the used car sales have been picking up rapidly. One reason assigned for this is that prospective purchasers are buying used cars for service until the new car prices shall have been finally settled. Certain it is that used cars have stood a harder fall than the new cars and can be purchased at correspondingly cheaper prices.

But the owners of old cars are not willing to let them go on this basis, and this is one reason the new car market has not been more active. Another reason is that there are few grapes around Sacramento. Despite prohibition and the threatened ruin to the grape industry it is the vineyardists who are buying cars.

Lodi, for instance, a small town of less than 5,000 inhabitants, bought more cars last month than Sacramento, with fifteen times the population. There are grapes around Lodi. Fresno is another example. This city, two-thirds as big as Sacramento, has bought twice as many cars, according to the records in the office of State Motor Vehicle Superintendent Charles J. Chenu.

Rice Crop Disappointing

Around Sacramento, and especially to the north are large rice fields which last year returned almost fabulous wealth, and rice growers bought cars right and left. Local dealers this year prepared for the rice harvest result, but were disappointed. Rains caused a 50 per cent loss in rice, and the prices were below the profit line. Hence, while grape growers of the San Joaquin, with immense yields and the highest prices on record, buy cars of all kinds, the Sacramento Valley with a poor rice crop and low prices, is buying few.

Townpeople, however, are buying at about the normal rate in Sacramento, although it may be said there is a noticeable depression even among wage earners and business men, as far as the buying of automobiles is concerned.

SERVICE BODIES MEET SHOW WEEK

New York, Nov. 26—The second annual convention of Automotive Service Associations will be held at the Hotel Commodore on the first day of Show Week, Jan. 10. The morning will be given over to interchange of ideas of association work and the afternoon to papers read by men prominent in the service industry and selected by a committee composed of a representative of each of the twelve existing associations. A dinner and visit to the automobile show in a body will close the convention activities.

Producers Not Pessimistic Over Predicted Oil Famine

**Plentiful Supply Always They Say—
Government Bureaus Do Not
Entertain Same Views**

WASHINGTON, Nov. 27—Pessimistic predictions about an impending petroleum famine at some time in the more or less vague future are not taken seriously by practical oil producers. This was evidenced in addresses at the first annual meeting of the American Petroleum Institute held here this week. Their views were at direct variance with those of George Otis Smith, director of the United States Geological Survey and the experts of the Bureau of Mines who have prepared impressive statistics showing that at the present rate of consumption the oil stocks of the world are likely to reach the vanishing point while the present generation still is looking for gasoline to run motor cars.

The men who have been in the oil industry for years simply refuse to get excited about the possibility of exhausted supplies. They have heard the same cry before. Their contention is that if prices are high enough, as they are now, they will spur production and that there always will be plenty of oil, even disregarding the enormous potential stocks in the huge shale deposits.

Plenty for Future Generations

Henry L. Doherty, one of the largest of the independents and who has been through many a hard fought battle in the oil business, is far from being a crepe hanger. This, in substance, is what he told the automotive industry:

"There will be plenty of gasoline for those of the present generation who are driving motor cars, for their children and their children's children."

Thomas A. O'Donnell, president of the Petroleum Institute and chairman of the board of the California Petroleum Corp., had this to say on the subject of future supplies:

"The public has been frequently alarmed by statements by well-meaning and learned scientists predicting an early exhaustion of our petroleum resources, in some instances giving more or less definite figures as to the supply still obtainable and setting a time for exhaustion within the life time of men now engaged in the business. Petroleum is widely distributed throughout the world and I believe in sufficient quantities to meet the requirements, present and future. If the economic law of supply and demand is given free opportunity to assert itself and artificial political and government restrictions are removed, allowing everybody from everywhere to participate in the prospecting and production necessary, there will be plenty of oil to meet the requirements in all parts of the world for many generations to come."

These views were shared by R. D. Benson, president of the Tidewater Oil Co.,

Director Smith took a more pessimistic view of the situation. He declared that economy in use and production was absolutely essential and that oil supplies should be conserved for the more essential purposes. He said that motor trucks, and tractors should be given first place in line at the filling stations, to the exclusion of "pleasure" automobiles, if necessary. He declared the situation might become so serious that government action would be necessary to save crude petroleum from the production of lubricants instead of gasoline.

It was evident from the addresses of most of the speakers that the incoming administration at Washington would be asked to insist upon an open door policy in all parts of the world in the exploration of oil fields so that American citizens would have equal rights with those of other nations in their development. Parceling out of oil fields among Great Britain, France and Italy was condemned in unmeasured terms and it was contended that if this policy was persisted in the United States should retaliate by conserving all its oil resources for the use of its own citizens. It was noticeable that this suggestion evoked prolonged applause.

Plans Made By Olds Dealers For Vigorous Sales Effort

Lansing, Mich., Nov. 26—Olds dealers from all sections of the country were guests of the factory officials Monday for an inspection of the plant and a conference at which the situation generally was discussed and plans outlined for a more vigorous effort in the sales end. President VerLinden addressed the dealers and told them about the improved machinery which had been installed, making for speed and economy. He urged that despite pessimistic reports of the last two months, indications pointed to a gradual upward trend, and told the dealers he looked for normal conditions to be in sight around the first of the year.

Charles Larson of New York (the oldest distributor in the Olds organization), told his fellow dealers there was a strong indication of a pick-up in business within the last few weeks and that a gradual improvement was noticeable. The same statement was made by A. S. Plughoff, San Francisco distributor, and W. W. Barnett, Denver distributor, who declared inquiries from prospects indicated a resumption of demand that would mean a restoration of normal conditions in the early Spring.

General Sales Manager C. A. Tucker told of his swing around the country in which he found a more optimistic attitude than had been apparent during the last three months, and he said he looked for a noticeable improvement by Jan. 1. Mr. Tucker said the outcome of the election had had a tendency to strengthen confidence throughout the country. He declared the information he was able to secure convinced him that a demand that would tax the capacity of the plant would be realized in the Spring.

District of Columbia Proposes to Establish Official Garages

**Bitter Discussion Provoked for Reason
That Favoritism May Be
Shown in Selections**

WASHINGTON, Nov. 26—Announcement that the Commissioner of the District of Columbia proposed a survey of automobiles and the establishment of "official inspection garages" has provoked bitter discussions among dealers, garage-owners, car-owners and others interested in the effect of such a project. One of the chief objections to the plan, it is said, is the opportunity it affords for political favoritism in the selection of authorized service stations.

District Commissioner Hendrick has suggested a plan calling for thorough inspection of all automobiles operated in the District of Columbia. It is proposed to issue certificates, in the form of a label, when the car or truck has been inspected and tested as to its mechanical condition. Under this plan, the police or accredited volunteers, would have authority to stop all cars or trucks which did not display the inspection sign. If the inspectors observed defects in the mechanism, the license numbers would be listed and the owner ordered to report for repairs at an authorized garage.

The contention is advanced that this plan would permit graft and unfair trade practices. The theory in this instance is that regular police or volunteers could suggest certain garages. It is also pointed out that scores of garages would be forced out of business through restriction of trade to authorized service stations.

Haynes Official Denies Rumor That Ford Has Bought Company

Kokomo, Ind., Nov. 26—A formal statement has been issued by the Haynes Automobile Co. emphatically denying a rumor to the effect that Henry Ford has purchased the Haynes company.

"There is absolutely no truth in the rumor that Henry Ford or his interests have purchased or are negotiating for the purchase of the Haynes Automobile Co. or for any part of the Haynes stock," Alton G. Seiberling, vice-president and general manager of the Haynes company says in the statement. "Such action has not been contemplated and the rumor is utterly without foundation."

TO DISCUSS ROADS RELATIONS

Washington, Nov. 26—Utilization of motor vehicles and good roads as the most effective solution of the transportation and marketing problem of the farm will be discussed at the second annual convention of the American Farm Bureau Federation at Indianapolis on Dec. 6, 7, and 8. An effort will be made to impress the assembled leaders in agriculture of the relationship of existing between these two essentials of transportation and the farmer.

Concerning Men You Know

Geo. C. Murray, formerly connected with the Aluminum Castings Co., has left Detroit for San Francisco, where he will have charge of the sale of Fruehauf trailers on the coast.

H. W. Avery, Jr., has been made director of Marmon sales by the W. D. Block Motor Co., Marmon distributors in Detroit. Mr. Avery for ten years was with the Packard organization as sales manager at Cincinnati and Buffalo, and as special representative for the Packard-Detroit branch.

Leigh Smith, who has been in charge of the service department of the Fisher Body Co., has been made service manager of the Fleethan-Buick Co. of Wyandotte, Mich.

R. H. Schmittiel, sales manager of the Detroit-Oakland Co. and one of the best known men on automobile row, has left the service of the Oakland company to locate in Los Angeles.

C. E. Denzer, formerly manager of western sales for The White Co., with headquarters in Cleveland, will take charge of the new White branch to be opened at Denver, Colo. He will have charge of sales and Thomas Parramore will be in charge of the service department. The Denver branch will be the distribution center for the greater part of the western territory.

W. F. Donlin, for three years associated with the King Motor Car Co., has been made general sales manager of the Barley Motor Car Co. of Kalamazoo, manufacturers of Roamer cars.

Ernest P. Lash has joined the Philadelphia Locomobile branch as sales and service representative. His headquarters will be at Reading, but his field of operations will include all the territory covered by the Philadelphia branch.

Richard H. Eddy, for ten years a member of the Frank O. Renstrom Co. organization, distributors for Grant, Briscoe and Premier cars, for Grant and Atterbury trucks, and for Twin City tractors, has been promoted to the position of

district supervisor of the company in the northern California district.

Roy L. Davey, who resigned recently as sales manager of the Bethlehem Truck Co., Allentown, Pa., has been made manager of the Detroit branch of the American Bosch Magneto Co., succeeding M. Tost, who has been made sales manager for the central district.

Samuel E. Ryder for the last two years equipment engineer of the Moto Meyer Co., with headquarters in Detroit has been appointed general manager of the Moto Meyer Co. of Canada, Ltd., Hamilton, Ont.

A. Elliott Ranney, second man to sell automobiles in New York City, and best known from his associations with the Hudson Co., has been appointed assistant general manager of the Porter-Lafayette Co., Inc., New York, formed a year ago to distribute the Lafayette.

J. M. Millard has severed his connection with Bailey-Drake, Chicago, merchandising engineers, with the purpose of representing exclusively the Metal Stamping Co. in the Southwest territory.

Mr. E. E. Allyne, president of Aluminum Manufacturers, Inc., and of its subsidiary, The Aluminum Castings Co., of Cleveland, Ohio, has resigned on account of ill health and is succeeded by W. P. King, formerly vice-president. Mr. King will also be treasurer. George J. Stanley has been made vice-president in charge of production. John H. Watson, Jr., remains secretary.

George T. Bryant, for the past few months general export manager of Robert H. Hassler, Inc., Indianapolis, has been appointed director of sales.

Frank W. Edlin, manager of the St. Louis branch of the Deere Plow & Tractor Co., Rock Island, Ill., has resigned to become domestic sales manager for the Moline, Ill., Plow & Tractor Co., and will be assistant to President George N. Peck.

depression, according to Mr. Town, who adds the first deposit has been paid on them and the balance will be paid on delivery. That of course is dependent he said on resumption of production in the factories which practically have been closed down for several weeks.

While the total sales are trifling compared to the normal business Mr. Town said, the condition indicates that the business is experiencing an awakening and is assurance that the market exists and needs only intensive effort for development.

Cleveland Tire Dealers to Form National Organization

Cleveland, Nov. 26—Benefits already given members through the operation of the Cleveland Retail Tire Dealers' Association are responsible for a decision by officers and members to organize a national association of tire dealers. This action was taken at a meeting in Hotel Winton. Cleveland is expected to be the headquarters of the new organization.

E. L. Green, chairman of the Better Business Commission of the Cleveland Advertising Club spoke at the meeting. He spoke of the advantage that comes by speaking for something through the influence that a strong national organization has. He urges the dealers to charge a fair price for their goods, not to revert to cut-throat reductions in order to outdo some other man in the business and argued that a fair price for material of merit is the best business policy, and one that will always bring success.

GASTON CHEVROLET DIES IN YEAR'S LAST RACE

(Concluded from page 16)

His version is that O'Donnell's left front wheel grazed Chevrolet's right rear wheel and the deflection caused Chevrolet to dart for the fence at the top and in trying to avoid him O'Donnell also drove into the fence.

Spectators at the spot say Chevrolet seemed to crowd O'Donnell too closely as the latter attempted to go by and O'Donnell's car struck the fence and on the rebound was plunged into by Chevrolet's car, the two tangling and rolling down the board wall. Johls was killed instantly and Chevrolet died in a few minutes. When Thomas noted the cars crashing at his side he turned down for the safety zone and escaped by inches. Photographic evidence shows Chevrolet's car ramming O'Donnell's.

Impact due to the speed at which the cars were traveling splintered the huge timbers in the guard rail and opened up a wide gap. Fortunately no other cars were following immediately and Starter Wagner waved the drivers to the lower edge of the track as they passed him. Sarles, Miller and Murphy did not slacken speed, perceptibly maintaining the highest average speed at which cars of this size ever have been driven in competition.

The body of Chevrolet will be taken to Indianapolis.

Railroad Revises Schedule Due to Shipments by Truck

Wilmington, Del., Nov. 26—The aggressiveness of the motor truck engaged in commercial traffic between Philadelphia, Wilmington, Baltimore and the Delaware-Maryland peninsula has caused the Pennsylvania railroad to curtail its way freight traffic on the peninsula. Heretofore, except during the war, when it was possible, these trains were operated daily to accommodate the traffic between the cities and the rural section, but motor truck lines have begun to operate all over the peninsula, with the result that the railroad company has announced that hereafter way freights will be operated only every other day.

This traffic applies not only to shipments from the country to the city, but also to the shipments from the city wholesale houses to the country. Then again, by the time a retailer pays his freight and the cartage from the railroad station, he is usually paying more for the goods than they cost delivered at the door by the wholesaler's truck.

DISTRIBUTOR BREAKS GROUND

Youngstown, Ohio, Nov. 25—Ground was broken this week for a new \$250,000 building to be erected for the Van Baalen Auto Co., which is the new name of the company that has been doing business as The Standard Auto Sales Co., distributors of Dodge cars, and headed by

I. Van Baalen, vice president representing Ohio in the National association and vice of the Ohio Auto Trades Association. The building will be constructed, it is understood to house also another motor business, probably The Mahoning Buick Co.

New England Makes Ready to Meet Snowfall This Winter

Boston, Nov. 26—To make preparations for traffic through snow this winter in New England 200 representatives of the Highway Department of various municipalities of this state, Vermont, Rhode Island, Connecticut, Maine and New Hampshire came to a meeting of the Massachusetts Highway Association at the American House here.

James C. Blake, president of the association and Street Commissioner of Worcester, was the presiding officer. Mayor Peter F. Sullivan of Worcester was toastmaster. The matter of snow control made discussion keen.

MICHIGAN SITUATION BRIGHTER

Lansing, Mich., Nov. 27—W. R. Town, secretary of the Michigan Mortgage Investment Co., who has just completed a survey of conditions in the automobile industry throughout Michigan, declares the situation has brightened considerably and predicts continued improvement. Hundreds of automobiles have been sold in the last month despite the

A Department of BETTER BUSINESS



Conducted by Ray W. Sherman

WHEN a customer makes a complaint what do you say? What you do say may be the cause of his going out a booster or a knocker. Now is a good time to start thinking just what your reply would be and, incidentally, send your answer in to MOTOR AGE. A dollar will be paid for every answer published. Here is what W. R. Reinhardt says—

Could You Say It Better?

When He Says He Is Never Coming Back Again, What Do I Say?

It just goes to show how human nature is. You and I have done business for eight years now and during all that time you have known that I have always given you good value for your money. Now because of a slight misunderstanding you tell me you are going to pass me up in the future. There is no use of our discussing the matter further, because we do not seem to get anywhere and it will take time to get the thing around to where you may feel better toward me. On my part I have the kindest feelings in the world toward you. Eight years of close association will never let anything like this affect me.

I am going to see you as often as ever and any time I have something special that I think will interest you I am going to mention it and when you get around to where you want to trade in your old car, let me know and I will make you an offer that might interest you and save you some money.—Marshall-Wells Co., W. R. Reinhardt, Spokane, Wash.

When He Says I Made a Promise and Didn't Keep It, What Do I Say?

I have always lived up to my promises if possible. If you phoned someone that you would be over to their place in thirty minutes and on the way over you fell down and broke your leg, would you consider it fair if that party accused you of not keeping your promise?

Intention is the thing that must be taken into consideration; there is a big gulf between the man who deliberately deceives you and the one who through some unlooked for accident or incident finds it impossible to live up to his agreement. That is why on most contracts, covering work to be done or deliv-

eries, etc., it is stipulated that everything is subject to strikes, fires, floods and other unavoidable calamities. Could I help it when my men deliberately layed off work Thursday afternoon? Would you if you had been in my place have done better? I am not going to take exception to your remark. The point is, however, that I want you to know that I am a man of my word.—Marshall-Wells Co., W. R. Reinhardt, Spokane, Wash.

When He Says More Time Was Spent Than Was Necessary on That Job, What Do I Say?

Mr. Johnson, let me ask you, Is the job satisfactory? Well, then, forgetting all about how long it took, Are you satisfied with the complete results? That should be the reply; but I will explain the thing to you so that you will feel perfectly satisfied; because we want all our customers to feel right about these things and we are very thankful for the opportunity to explain matters of this kind. In the first place a good job costs time.

We used to have a man around here who could turn out a lot of work quickly, but when he got through it took two men and a boy to repair the other damage done. The varnish was all scratched, grease and dirt was everywhere and screw and bolt heads were jammed so that it was sometimes a question if the parts could be conveniently reached again. This was not all, for sooner or later the old trouble would crop out again, because as we found out later to our sorrow, while everything would be done to get the car in running order for the time being, it later developed that a cotter pin had not been properly fastened or a partly worn ring should have been replaced while the machine was down, and so on. This man does for a fact take a lot of time, but when he is through you can bet every dollar you have that the job is perfect and you can start out for a trip across the continent if you want to and your mind

will be at ease as far as his work was concerned. We will guarantee the job you had done. Is your peace of mind worth anything? Come again whenever you need some work done and you can depend on the job being done right in the first place.—Marshall-Wells Co., W. R. Reinhardt, Spokane, Wash.

When a Customer Says My Shop Charges Are High, What Do I Say?

Mr. Johnson, I am very sorry you have that impression, because it does me a great injustice, but I am mighty glad to have learned of it so that I can set you right. You will remember when you came to me, you admitted that you had already spent \$40 trying to have that knock taken out of your engine and now you find fault with my charge of \$12 after telling me that the knock had finally been located. Suppose I had spent two days on the engine and charged you at the rate of \$6 a day but at the end of that time told you that I would make a minimum charge but that knock could not be located, I suppose you would have gone ahead and listened to that knock the rest of your life.

But because I went to the trouble and expense to bring a man here who has served eight years at the factory in just that sort of special work and necessarily paying him a big salary per hour, you say my charges are high. I think, Mr. Johnson, you must admit that you are wrong and that I should be congratulated upon having enough pride and honor in making my shop the best possible for service.—Marshall-Wells Co., W. R. Reinhardt, Spokane, Wash.

When He Says All Dealers and Garagemen Are Thieves and Robbers, What Do I Say?

Well, now, that's a little strong and the only way I can reconcile myself to that is because even though you appear to be serious I would be doing you a great injustice to accept a remark of that kind seriously. Mr. Johnson, you have at times on a Sunday morning or holiday, especially, gone out to do a little work on your car, thinking it was going to take you perhaps thirty minutes or so, but you went on and on and the first thing you knew you were spending the greater part of the day

on that job. Why? Because you learned that in order to do the job right, it took time and lots of it.

You were not working on a wheelbarrow or a ditch or a place where you could take an axe or a maul and go after it. You realized intuitively if not otherwise that you had an expensive piece of property, on which it was necessary to proceed very carefully if you wished to avoid scratching the varnish or jamming the nuts, etc., and that's the way it is with us.

We teach our men to realize this and to have some respect for your property and investment and if you will stop and think a moment you would rather pay a trifle more and feel sure when you brought your car here that the job would not only be done right but that your car would not be covered with grease and dirt and scratches. You are a business man and appreciate my investment. You know what I have to pay my help in order to get the right kind. I am here at your call at every hour. Would you expect less than you know I am getting out of it if this business was yours?—Marshall-Wells Co., W. R. Reinhardt, Spokane, Wash.

When He Says the Job Was Not Done at All, What Do I Say?

If that is so I will certainly see that the job is done and done entirely satisfactory and the part that has been done, if not done correctly, will be remedied without another cent of cost. I want my customers to know that when they bring a job here, that job is to be done correctly and completely; a job that will mean a satisfied owner and be a credit to me. I positively will not tolerate any slipshod methods. I hire the best experts I can get in their particular line of work and tell them to take the time to explain to our customers that good and complete work takes time, and while it takes more time and costs a little more, in the end everybody is better satisfied and there is no come back.

So many customers come in and want a job attended to at once, must have it by noon, etc., regardless of how many machines are ahead of theirs and without thinking further they tell our men that they simply must have the machine by noon. That's the foundation of the difficulty. Let's go back and see Jim and find out why he did not do the job right. I am surprised because he is acknowledged around here as being the best ignition man in this part of the state and has a reputation of doing his work right. Jim come over here a minute.—Marshall-Wells Co., W. R. Reinhardt, Spokane, Wash.

"Only Going Cars Can Keep Business Coming"

Letter suggested by the Dine-De Wees Co., Canton, O., to be sent to car owners to stimulate winter business.



Remember—only going cars can keep business coming and the way to keep cars going and business coming is to sell car owners the idea of WINTER DRIVING, and what you can do for them to rob winter driving of its unpleasant features.

A SUGGESTION

Instruct every member of your organization to talk it to every motorist that comes in.

Make a prominent display of Winter Equipment.

Send a letter on the subject to every one of your customers.

Again we say, "ONLY GOING CARS CAN KEEP BUSINESS COMING!"

Of course you are going to drive your car during the winter months.

And why not?

We are in position to eliminate all the disagreeable features of winter driving for you, so there is no reason in the world why you should not derive as much benefit and pleasure from your car during the cold months as you did in the "good old summer time."

Here are a few items that will rob winter driving of its unpleasant features:

Robes.	Steer-Warms.
Electric and Exhaust Heaters.	Spotlights.
Chains and Adjustors.	Windshield Cleaners.
Hood and Radiator Covers.	Tire Covers.
Motometers.	Foot and Hand Warmers.
Alcohol and Anti-Freeze Solutions.	Tires.

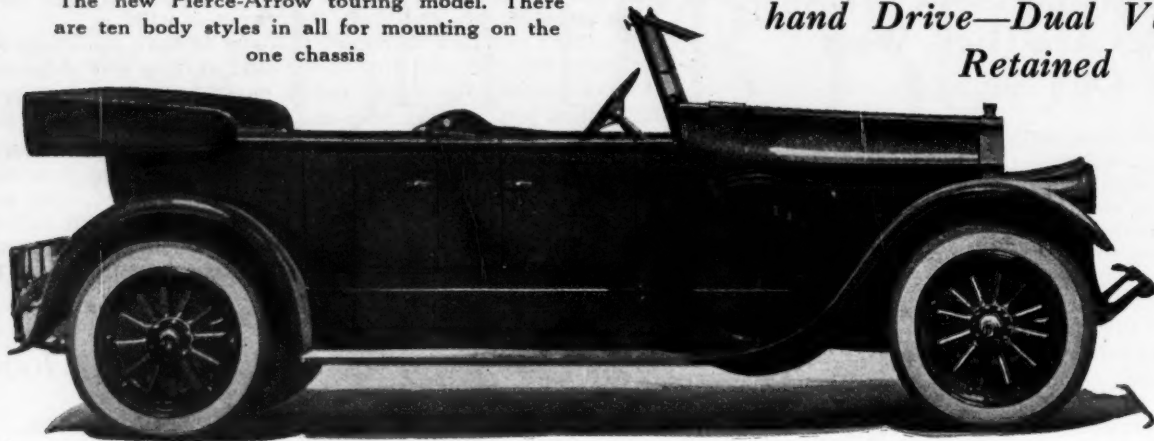
Come in, bring this letter along, and let us show you the necessary equipment that will make your car an All-the-Year-'Round Car.

Yours very truly,

Pierce-Arrow in One Chassis

The new Pierce-Arrow touring model. There are ten body styles in all for mounting on the one chassis

All Bodies Will Be Fitted to It—Left-hand Drive—Dual Valve Engine Retained



A SINGLE model, which will be known as the Pierce-Arrow, has replaced the two cars, 38 and 48, formerly produced by this company. The new car embodies many of the features of both of the old methods but corresponds more nearly to the 38 with the exception of the wheelbase which is 138 in. The weight is about 500 lb. less than the 48. The number of body models has been reduced by the elimination of some which were not in great demand, and the net result is that there are now only ten bodies which cover a large field of usefulness.

The dual valve construction has been retained in the new engine. The cylinder dimensions are 4 by 5½ in., which are the same as used in the old 39. The new engine, however, develops about the same power as the one in the 48, and this result is obtained by increasing the speed range. The speed range on the new model is from 200 up to 3000 r. p. m. The six cylinders are now cast in a single block instead of in pairs as was formerly done. The cylinder head is detachable and a pressed steel covering is provided which completely encloses the top of the engine.

Dual Spark System

There have been no material changes in the engine lubrication system. A specially designed, Delco double-ignition system, which has two distributors, provides two separate sparks for each cylinder. The wiring is arranged so that either set of plugs may be fired singly or simultaneously. The whole mechanism is very compactly arranged, and is located on the left side of the engine at the front, drive being taken from the timing gears. The cables to the spark plugs are completely enclosed in a metal conduit of rectangular section.

A Delco starting-lighting system has replaced the Westinghouse units formerly used. The generator and water pump are located on the right side of the engine, and are driven by the timing gears through flexible fiber couplings. The starting motor is located at the rear of these units, and the engine pan comes

Specifications of the Pierce-Arrow

WHEELBASE—138 in.
ENGINE—6 cylinders, 4 by 5½ in.
IGNITION—Delco, double system.
STARTING AND LIGHTING—Delco.
CLUTCH—Multiple dry disk.
GEARSET—3 speed selective.
REAR AXLE—Semi-floating.
BRAKES—Service contracting band, emergency expanding band.
SPRINGS—Semi-elliptic all around, extra long in rear.
WHEELS—Artillery type.
RIMS—Firestone demountable QD.
TIRES—35 by 5 on large models, 33 by 5 on 4-pass. and less.
GASOLINE TANK—26 gal. pressure feed.
ALEMITE—Chassis lubrication.
LEFT HAND DRIVE—On this model for the first time.

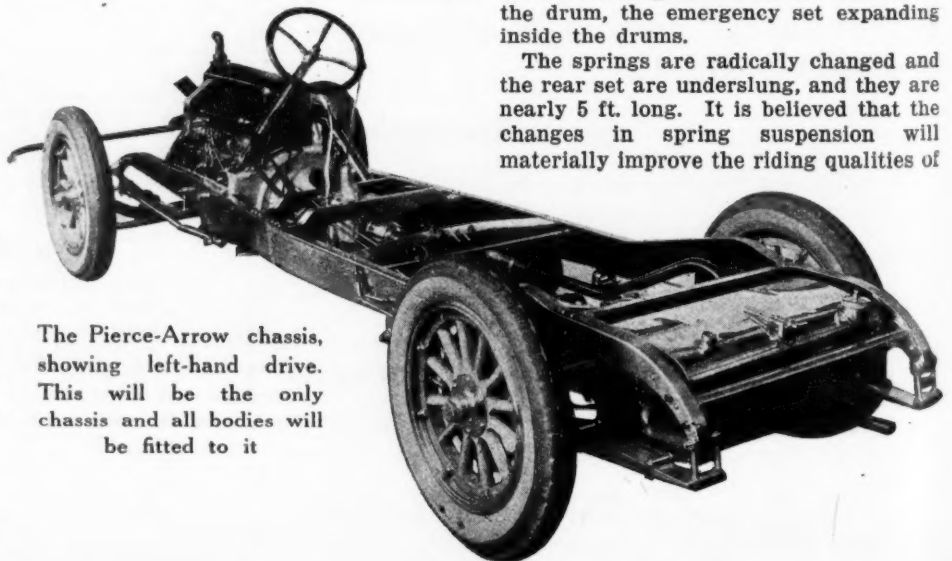
up under these auxiliaries in such a way as to protect them. The position of these units makes them very accessible for both adjustment and repair.

The carbureter is a Stromberg and it is located on the left side of the engine between cylinders 3 and 4. The hot stove is located in a similar position on the other side of the engine, and the air passage to the carbureter passes between cylinders 3 and 4.

The control has been changed so that the spark and throttle levers are on top of the steering wheel instead of underneath as formerly. The foot accelerator pedal is of the roller type. The gearset is mounted amidships and is of the selective sliding type. The fourth speed has been eliminated in this model as there is really no need for it with this flexible and powerful engine. The clutch is of the multiple dry disk type. The tire pump is mounted on the gearset and is controlled from the driver's seat.

No very important changes have been made in the axles. The brakes have been changed from the shoe brake type to the band type. The service set operate the contracting drums on the outside of the drum, the emergency set expanding inside the drums.

The springs are radically changed and the rear set are underslung, and they are nearly 5 ft. long. It is believed that the changes in spring suspension will materially improve the riding qualities of



The Pierce-Arrow chassis, showing left-hand drive. This will be the only chassis and all bodies will be fitted to it

Pierce-Arrow

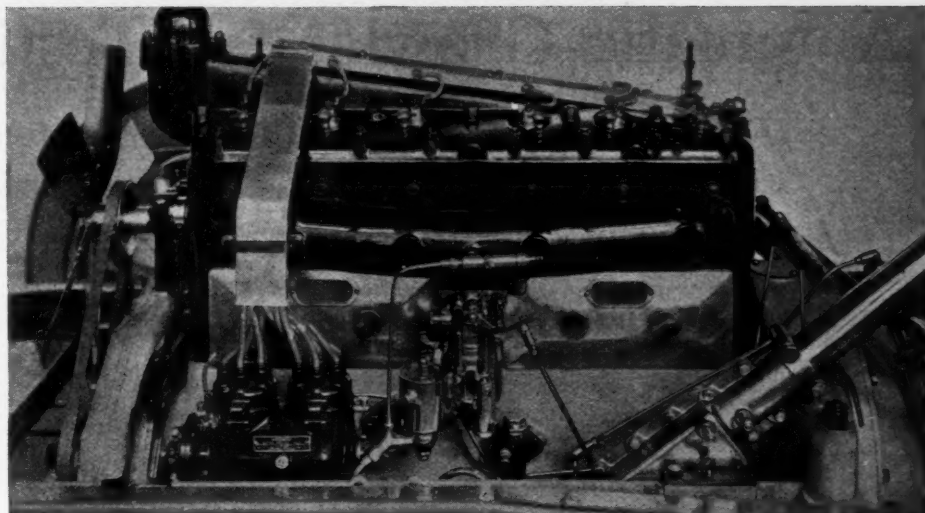
BODIES AND PRICES—

Roadster	\$8000
3, 6 and 7 pass. touring....	7500
4 pass. Coupe-Sedan.....	8500
4 pass. Brougham.....	8500
Limousine	8750
Cabriolet and Sedan.....	9000
Vestibule Sedan	9000
Chassis	6000

the car. The wheels are wood artillery type on all models, and are now fitted with Firestone demountable rims with quick detachable channels. An option of Goodrich, Goodyear or United States cord tires is given. The size is 35 by 5 in. all round on all models except the 4-passenger and less, on which the size is 33 by 5 in.

The headlights are integral with the fenders. The enclosed cars carry the lamps on brackets, but either type may be had on all models. The headlights are fitted with small driving lights for city use, and also have non-glare lenses.

All enclosed cars are fitted with heaters. The Alemite system of chassis



The new Pierce-Arrow engine retains the dual valve, but is now of the block type. A specially designed Delco double ignition system is used which gives two separate sparks for each cylinder

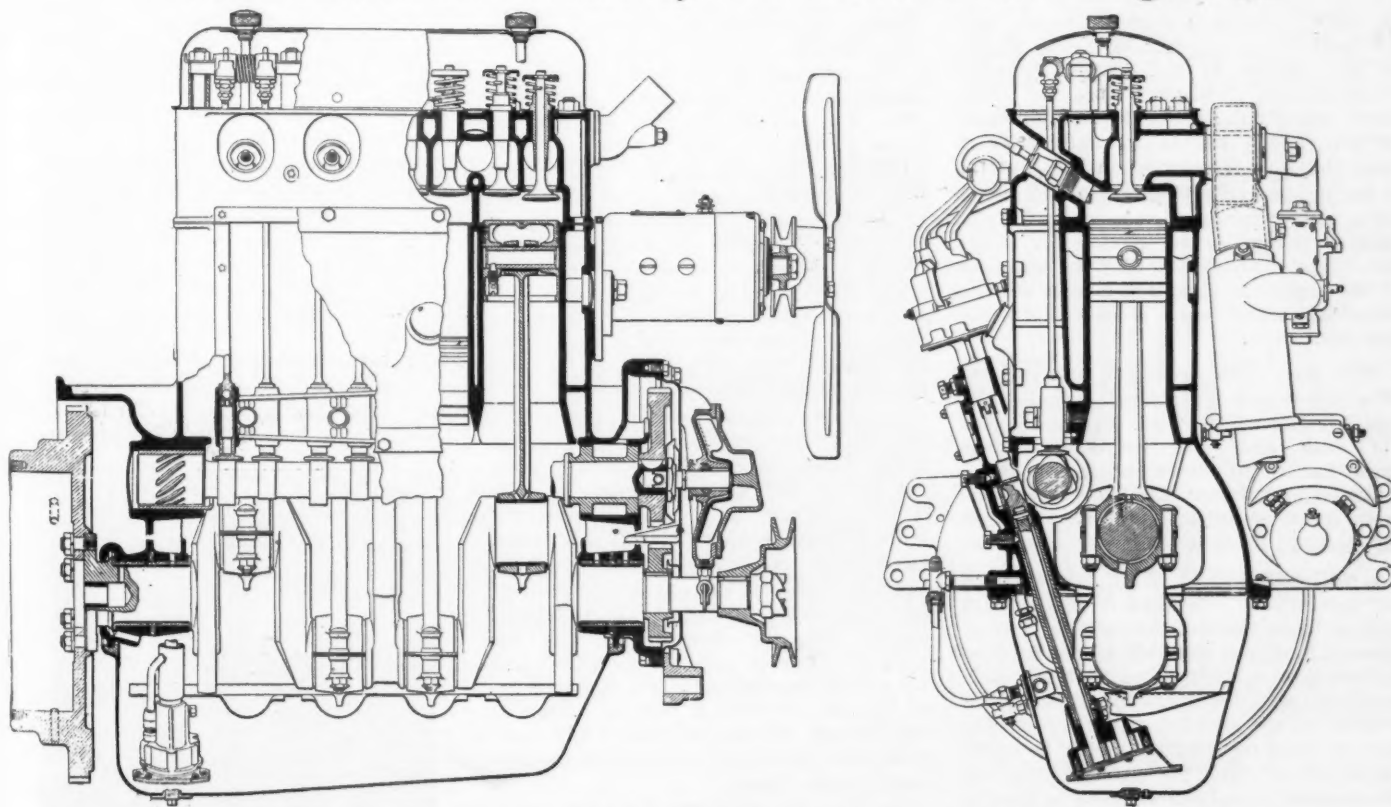
lubrication is supplied as regular equipment.

IMMEL FUTURE UNDECIDED

Columbus, Ohio, Nov. 29—The future of the Immel Co., large body manufacturers of Columbus, which has been in the hands of R. H. Schriver as receiver for the past two months, will soon be determined by a meeting to be called by the

receiver. The American Appraisal Co. has completed an appraisal of the assets and an auditing concern will soon complete the auditing of the accounts. When this work is finished a meeting of the creditors and stockholders will be called to discuss its future. F. A. Miller is now in charge of operations and the output has been doubled under the receivership with much less overhead.

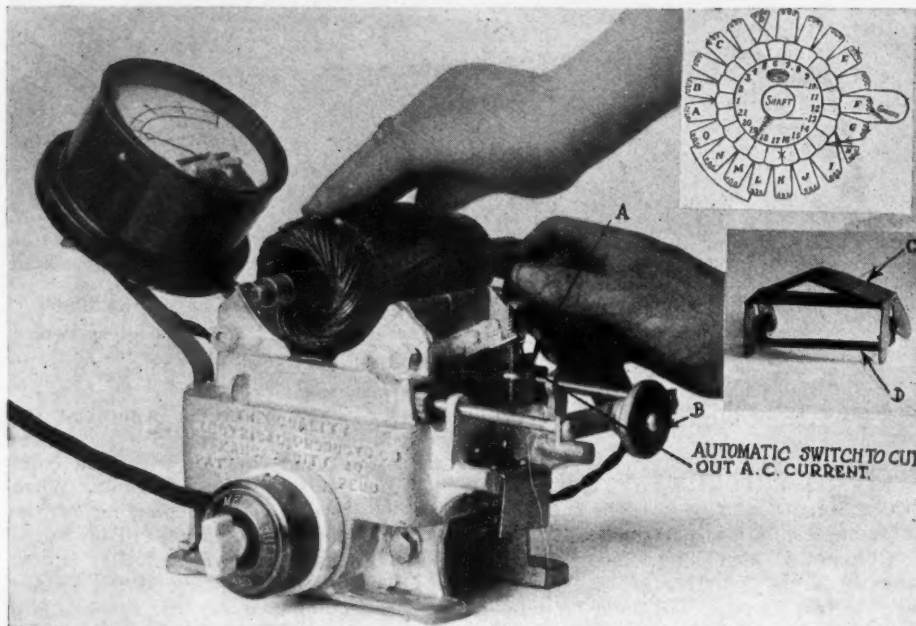
Cross Sectional Views of the Nash Four Engine



Left: Longitudinal cross section of the Nash four-cylinder engine. Several very interesting features can be studied from this illustration. One is the generator drive, which is not exactly new, being used in the Nash Six as well. The water pump drive is positive for it is driven from the forward end of the crankshaft. This makes a very accessible construction. The cut-in gear on the rear camshaft bearing is for the drive of the distributor and the oil pump. Right: End view of the Nash four engine. The inclined oil pump and distributor shaft can be seen in this view

Automatic Growler for Testing Armatures

Feature Is Switch Which Opens the A. C. Circuit When Growler Is Not in Use and Prevents Burning Out of Coils



Above is shown the complete growler, A indicating the sliding bars or magnetic shunt operated by handle B

A NEW automatic growler which will sell for \$57.50 is now being placed on the market by the Quality Electric Products Co. of Kansas City, Mo. The most important feature is an automatic switch, which serves to automatically open the A. C. circuit when the growler is not in use and prevents burning out of coils, thus removing fire hazard. This is also a current saving device. A shunt bar is also provided to vary the strength of the magnetic flux which acts on the armature when same is placed on the growler.

This regulation feature allows the use of a coil which gives ample strength to test starting motor armatures and series field coils, and when cut down by the shunt bar is suitable to test generator armatures and shunt field coils. An ammeter of the milli-ammeter type is used for testing for the following reasons:

It will stand up to 10 amperes current for testing for the reason that a coil with a loose connection such as a poor contact in Commutator-Bar due to poor soldering or a broken lead with the ends touching, will be instantly detected, on account of the amount of current necessary to show a reading, which is many times greater than the current taken by a voltmeter, telephone receiver or even a lamp.

A loose lead in commutator or even a broken wire whose ends are touching will allow the small amount of current taken by a voltmeter to flow and the results would be that you would get a good

voltage test and defects would not always be indicated.

The ammeter is especially valuable in testing a flying cross, open, or ground. This is a peculiar fault to which armatures are liable. This is due to a loose wire that only gives trouble when armature is in motion, the loose wire may either be broken, it may have loose connection or it may have defective insulation that allows it to come into contact with other wires or touch the iron core which causes a ground as soon as the armature comes up to speed, in any case the fault is not apparent and gives no trouble as long as armature is at rest.

However, the growler test will enable this kind of trouble to be easily detected. When ammeter leads in hand piece are placed on the commutator bars, to which this coil is connected, the coil will be locally short circuited through the ammeter which has practically no resistance and the current set up in this coil will be acted on through the alternating magnetic flux set up by the growler winding and the magnetic flux set up by the current itself, the reaction of the two causing a racking action or tendency to vibrate the coil. Any loose wire will vibrate and defects will be indicated on the meter.

In the drawing we have shown a 21-coil armature with commutator connections and have indicated all the troubles that the armature is subject to.

Coil E has a short circuit in coil.

Coils A and B have their leads loose in commutator bar No. 1.

Coil C has a wire broken and is open circuited.

Coil D is connected in reverse direction.

Coil F is grounded to frame.

Coils G and H and I are properly connected in relation to the coils, but have their leads or ends placed in the wrong commutator bars.

Commutator bars 16 and 17 are short circuited.

Commutator bar 19 is grounded to shell or shaft.

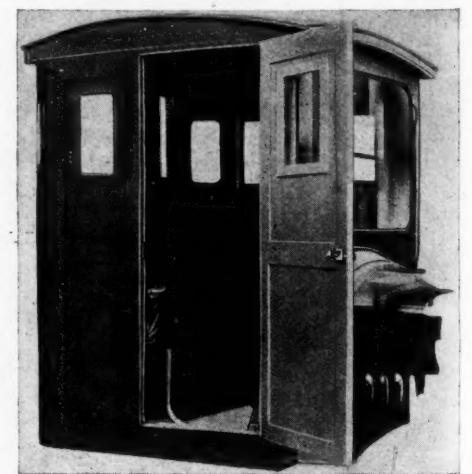
Coils L and O are short circuited. This makes coils L, M, N and O a closed circuit on themselves through commutator bars 18, 19 and 20.

Bug Detects Currents

This illustration also shows the complete growler, A indicating the sliding bars or magnetic shunt operated by handle B. The hand piece which is used to connect the ammeter to the commutator bars and coils to ground or shaft is shown in the operator's hand. C is the aluminum case of the bug and D is a piece of soft steel held loosely in the case so that it is free to vibrate.

This takes the place of the hack saw method of testing for faulty coils. This bug consists of an aluminum shell in which is fitted loosely a thin piece of flat steel. When this steel is passed over the core of the ammeter, if there is any alternating current flowing in a coil, this piece of steel will vibrate and act as a buzzer, instantly indicating the presence of any current. Take a case of an armature whose coils have charred.

Insulation, or moisture, will cause numerous short circuits, however, the current flowing is a very small amount that would not be detected with the ordinary method of passing a light piece of steel held in the hand. It would be indicated with the above described bug on account of its extreme sensitiveness.



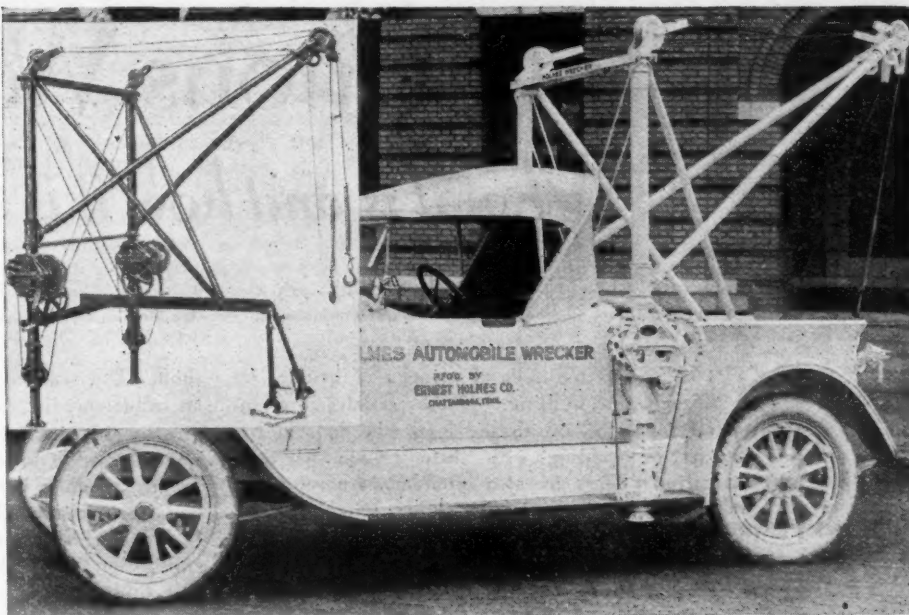
The Acme winter cab

This is a part of the growler equipment and is fastened to the set with a small chain to insure its presence when needed.

As an example to show how this outfit may be used we will give the procedure for condition No. 1, where coil E has a short circuit in the coil. Place armature on growler poles, this turns on alternating current in growler coils. Pull bar A out as far as it will go, take testing bug and place it on core of armature. Turn armature slowly, keeping bug on core. When slot containing coil E is brought under the bug, the current which is flowing in the local circuit formed in coil E will set up an alternating magnetic flux, or field, which will attract and repel the steel vibrator piece, with the results that it will act as an ordinary buzzer and indicate that coil in slot is short circuited.

Mark this slot with a piece of chalk and proceed with the test when the slot containing the other side of this coil is brought under the bug, it will again vibrate and you will know the coil in slot is short circuited. If these two slots are the only ones in core to make the bug vibrate, you will know that you have only one short circuited coil. To tell in which bars this coil is connected to commutator, take hand piece and adjust points to span adjacent commutator bars.

Place test points on commutator bars and pull bar A out a little, now with point on commutator. Rotate armature until you have the highest reading on ammeter, this indicates the point where coil being tested is in the strongest magnetic field of growler. Note this point and take all readings from same. Now pull bar A out until you get at least two-



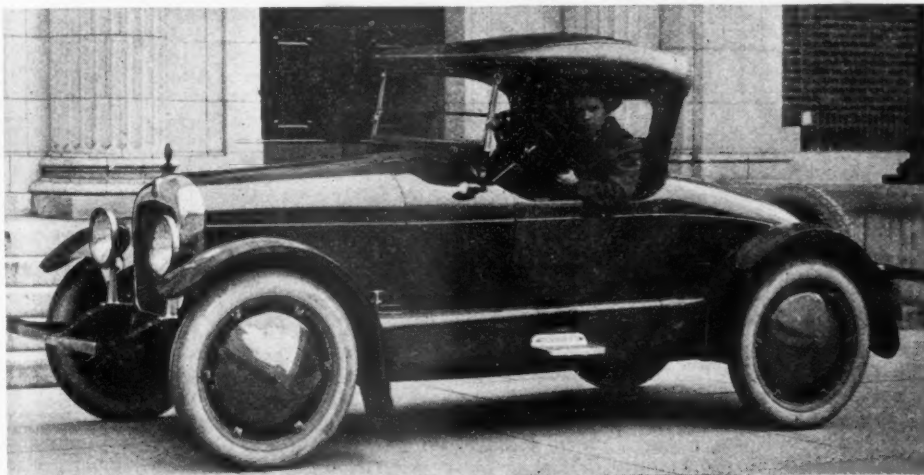
Wrecker for Attachment to the Service Car

The Holmes Auto Wrecker manufactured by the Ernest Holmes Co., Chattanooga, Tenn., is a practical patented equipment for taking wrecked cars out of the ditch and towing them into the repair shop. The principal point in the construction of the wrecker is that while it is mounted on an automobile, it has legs that rest on the ground when the wrecker is in action. It becomes a derrick. Thus a wreck can be pulled from any angle and from a distance as great as 100 ft. It has also a patented drawbar to enable the wrecker to tow a disabled car to the shop, the drawbar being so constructed as to prevent oscillation

thirds full scale reading and rotate armature taking reading of each pair of bars.

When you get to bars 9 and 10 your reading will be low, and will depend on how many of the turns are short cir-

cuit, thus if the coil has ten turns and other coils have a reading of 100 points on meter, a reading of 65 would indicate that about one-third of the turns of coil E are short circuited.



The Ace Roadster—A Sport Type Model

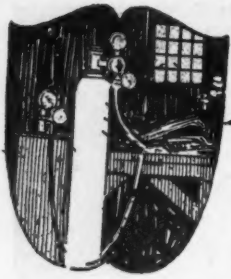
The Ace car, made by Apex Motor Corp., Ypsilanti, Mich., might aptly be described as a sport type car, with its low appearing body and long straight lines, its individual fenders and step plates. The car is built up from standardized units many of which are familiar to the trade. The engine for example is a six-cylinder Herschell-Spillman product having a bore and stroke of $3\frac{1}{4}$ by 5 in. This engine has been described at length in these columns before and, therefore, we but mention it in passing. The other portions of the unit power plant are the dry disk clutch having six Raybestos faced disks, and the Warner three speed gearset. The rear axle is of the floating type and is connected to a ball and socket type universal joint. The electrical system is Auto-Lite except for the ignition which is Atwater-Kent

Acme Winter Cab

WITH the increase in long distance hauling and trucking, and with the realization for the need of weatherproof cabs in winter time, these units are rapidly being developed to a very high state of efficiency. The Acme Motor Truck Co., of Cadillac, Mich., has just brought out a standard winter cab which can be furnished on all of its models. It is so designed as to preserve the lines of the vehicle and it is recommended for use with the Acme truck because of its better fit and the blending of the lines of the cab with the appearance of the truck body.

This new cab is constructed of oak and built around the regular seat box. It is completely ironed at points of stress and designed to stand up under rough service.

The general dimensions of the cab are as follows: Width 48 in.; height from top of frame 61 in.; depth from front to rear, same as on standard models; height from top of cushion to inside of roof 40 in.; ventilating windshield, length $41\frac{1}{4}$ in.; ventilating windshield, height $23\frac{1}{2}$ in. The list price of this winter cab is \$125.00.



Autogenous Welding

What it is and how it is applied



THIS is the twentieth of a series of articles on autogenous welding. These articles are intended to be of aid to the man who must learn the art of welding with little or no personal instruction. They are also intended as a reference for the man attending a welding school. It is likely that during the first few months of his instruction many problems will come up that may be solved more readily with these articles on hand.

Finally, this service should be of benefit to any automotive service man or repairman, even though he never intends to have a welding torch in the

shop. The reading of these articles will give him an understanding of the subject which should greatly aid him in general repair work. He will be better able to decide, when he has a part to repair, whether it is feasible or not to weld it, and if so, if it will pay. The more familiar one becomes with this art, the wider the scope of its application. The man who is versed in the art will find many clever applications that one who is less familiar with the subject would never dream of. An understanding of welding principles offers a new technique to the repair man.

Part XX—Welding Aluminum

CAST IRON GEAR TEETH

IT is not expected that cast iron gear teeth will be encountered very frequently in automobile work. Nevertheless their repair is worth while describing because of the possibility of jobs coming in from other fields, Fig. 81.

Preheating is not necessary for gears less than 3 in. in width and 1 in. thick.

In doing a job of this kind the greatest care should be taken to start it properly. The metal on the rim of the gear to which the teeth are to be added must first be melted thoroughly and then the welding rod is added. It is necessary to control the metal so that the least amount of machining or finishing is required. The tooth or teeth can be built up so that very little finishing will be required if carbon blocks are placed between the teeth.

Care must be exercised that the tooth is built up fully and that a little metal

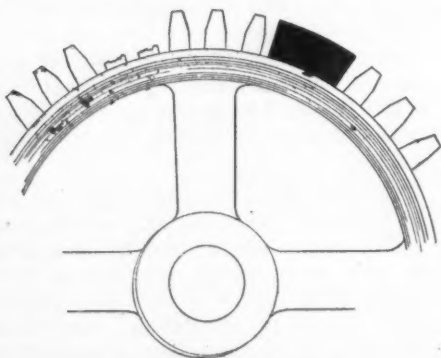


Fig. 81—Welding cast-iron gear teeth

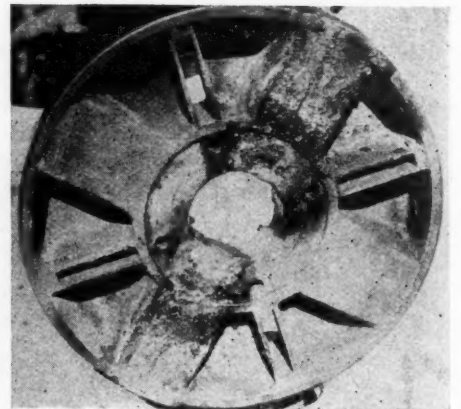
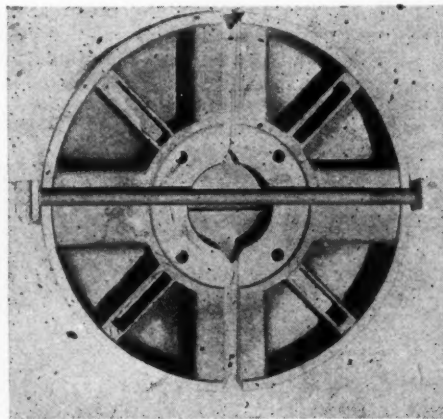


Fig. 80—The casting resembles a flywheel or a pulley and is of interest, although it is not the part used on an automobile. The break has occurred at a point where the metal is quite thick and the metal is V-d on both sides as well as on the ends. The two halves have been clamped together, as shown by the two transverse rods. This clamp arrangement will not interfere with expansion, inasmuch as the rods will probably be heated enough so that they will expand equally with the casting. Such a job offers no particular difficulties and should be handled in the manner described for a weld in which one side is welded and then the other. The second photograph shows the finished job

extends over each end. This metal may be removed later with a file. The weld must be cooled slowly to prevent undue brittleness.

ALUMINUM

Aluminum is rolled or cast. Rolled metal varies in purity from 98 per cent to 99.75, the impurities being mainly silicon and iron.

Pure aluminum is rarely used for casting purposes because its strength is low;

usually it is alloyed to increase its strength. Zinc is the metal usually used—from 5 to 25 per cent, occasionally with a small amount of copper.

Aluminum has a very low melting point, 1215 deg. Fahrenheit. It is of high thermal conductivity and has a high specific heat.

The oxygen of the air acts on aluminum to form a thin coating of oxide and when fused a heavy coating forms. This oxide is very refractory, melting above



Fig. 82—The welding of the cast iron expanding brake shoe is shown above. This shoe was broken in two spots. The metal was V'd out along the breaks and then the shoe was placed flat on the table and tacked or spot-welded inside and outside, so as to hold it to shape while the welding job was being done. The gas blow torch is used to supply additional heat and thus economize on oxygen and acetylene. It will be seen that it is playing directly on the weld where the operator uses his torch and welding rod. This photograph illustrates in an excellent way the use of a heating torch

5000 deg. and since it is heavier than molten aluminum it will sink into the molten mass unless it is removed.

It has a short fusion range retaining its normal properties up to a temperature very close to fusion when it becomes pasty and passes rapidly into complete fusion. Oxidation is very rapid just previous to fusion.

The metal when molten is quite fluid. Gases such as nitrogen, carbon monoxide and hydrogen, are easily absorbed and if not worked out will produce blowholes and porosity.

Because of the rapid fusion and fluidity welding requires considerable practice in order to properly control the blowpipe.

The greatest difficulty is that of removing the oxide. On sheet aluminum work a flux should be used, usually a composition of alkaline fluorides and chlorides. It is applied to the weld by the welding rod or it may be dissolved in water to form either a paste or a liquid and applied with a brush. This flux will react with the oxide and form a fusible compound that will float to the surface, this molten mass then acting as a protective coating preventing further oxidation and

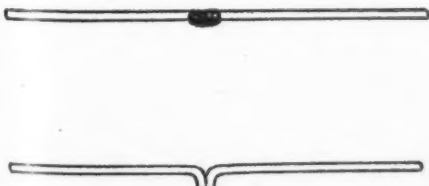


Fig. 83—Welding thin sheet aluminum

absorption of gases. The welding rod should be as pure as possible.

In preparing the metal for welding the edges to be welded and the adjacent surfaces should be carefully cleaned. In heavier sheets the edges should be beveled. In the lighter sheets the welding will be aided by flanging them about 1/16 in.

All aluminum articles should be preheated to some extent before welding. In certain cases the playing of the secondary flame on the object will be sufficient. In others a more thorough treatment is required.

Aluminum castings are handled somewhat differently from sheets or plates. Since the metal has a low melting point, high conductivity and becomes rather fragile previous to fusion, preheating and cooling must be carried out very carefully.

The use of a flux on castings has been abandoned by a majority of welders. In place of it they break down and remove the oxide by means of a paddle which is also used to smooth the surface of the weld.

WELDING SHEET ALUMINUM

In welding two aluminum plates 1/16 in. thick it is desirable to turn up the edges, Fig. 83, and perform the edge weld. A faster, neater job is the result. Aluminum melts very rapidly and, therefore, a small, light blowpipe that can be moved quickly should be used. The same size welding flame should be used as on sheet steel of the same thickness.

The oxide cannot be removed by scraping on thin sheet work.

Because thin sheets of aluminum are so difficult to hold when melted the direction of the blowpipe flame should be almost horizontal. If the flame is pointed down it will blow a hole through it. When starting an edge weld of this sort a light filling wire should be used. The diameter of the filling rod should be approximately the same as the thick-

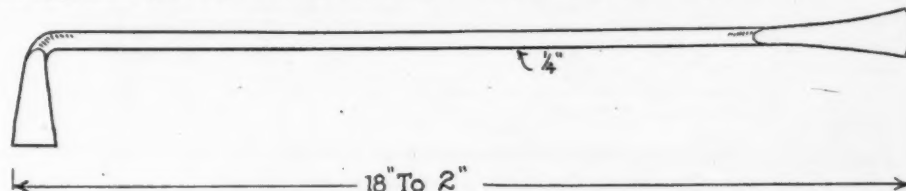


Fig. 84—Paddle used in welding aluminum castings

ness of the sheet. When starting this weld a small spot or drop should be added from the filling rod; this is all. The seam may then be fused by applying the flame.

The flux may be applied to the edge weld by first mixing it in water and adding the liquid to the edges by a brush. Welding should not be started until the flux is dry. If the edges do not run together during welding a little more flux may be added by dipping the filling rod in the flux and holding the rod in the weld.

To make a butt weld let us take two 1/4 in. plates. They should be placed on a piece of asbestos or fire brick. If they rest on metal the heat will be conducted away too rapidly. A 3/16 welding rod

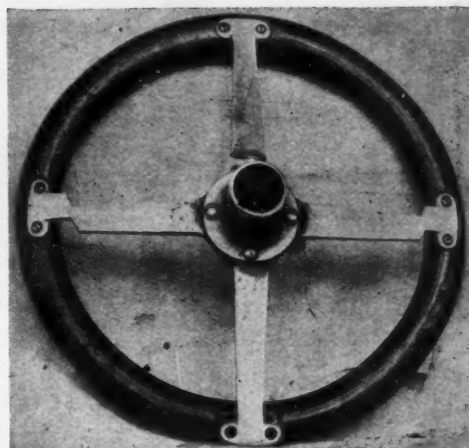


Fig. 85—Welding an aluminum steering wheel spider is an easy problem. It is thin cast metal and should be treated accordingly, as described in the section on aluminum. It is interesting to note that the opposite spider has been loosened from the rim of the wheel so as to permit expansion

should be used. Flux may either be applied by dipping the rod in it or by brush.

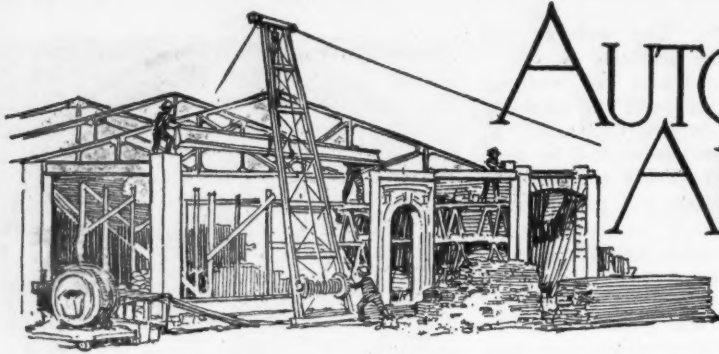
After the weld has been completed the flux and oxide that have accumulated on top of it should be washed off with warm water to prevent corrosion of the weld.

The weld should be carried on continuously. If it is gone over a second time there is danger of cracking.

The treatment of cast aluminum is a little different from sheet aluminum because of zinc and other alloys in it. A flux should not be used. The oxide is scraped off by means of a paddle, Fig. 84. The paddle is made of 1/4 in. iron rod with the ends flattened down so that the edge is about 3/8 in. wide. The flat end should be ground smooth.

In welding an aluminum casting the flame is played on it until it is melted. The metal is then brought together with the paddle. The paddle breaks down the oxide which is on the melted aluminum and which would prevent it from running together. After the welding is started the paddle is laid aside and the welding rod added. After the V is about half filled the welding rod is laid down and the paddle taken again. Working the paddle in the weld insures a proper bond at the bottom of the V. Then fill up the weld to the proper thickness and smooth up with the paddle. Sufficient reinforcement should be added for finishing.

An aluminum weld, particularly cast aluminum, should never be started without preheating.



AUTOMOTIVE ARCHITECTURE

Planning and Building Problems
CONDUCTED BY TOM WILDER



Triangular Plot for Public Garage

No. 290

Please give suggestion for the lay-out of a one-story fireproof public garage. The plot is triangular in shape. This plot already has an oil station in front, with drive-ins from the street, one in and one out, leading directly to rear of oil filling station, or in front of the plot on which we intend erecting our garage building.

We wish to have an exit at the rear corner, as well as a front entrance connecting with the drives already constructed in front.

This garage will be used entirely for public storage, allowing for a medium office and rest room only, and will hold approximately eighty-five cars.

Kindly give us an idea as to where to place necessary aisles, both incoming and outgoing, to utilize space to the best advantage.—Ramsey Accessories Mfg. Co., 1513 North Broadway, St. Louis, Mo.

This plot is not suited for the economic storage of motor cars, and is of such shape that it will require a maximum expenditure for a building.

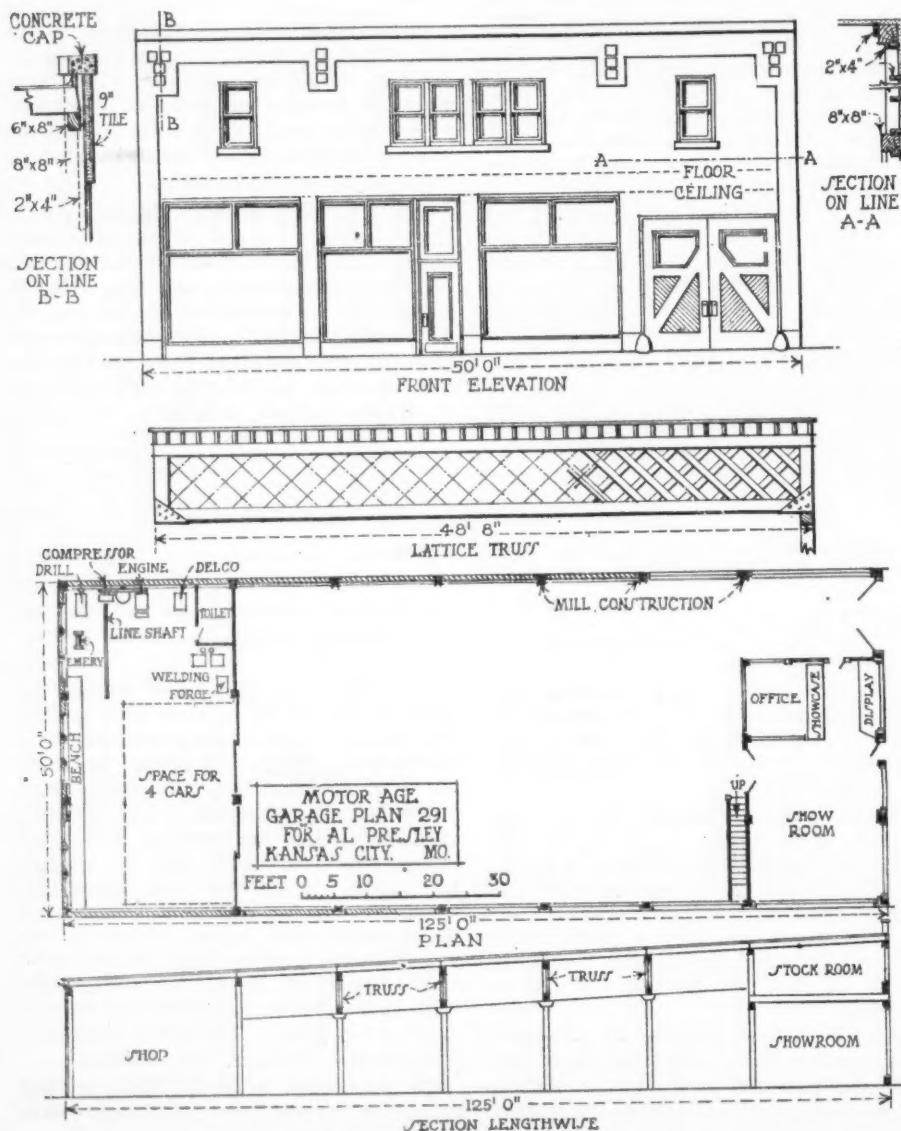
It would be all right for a warehouse

in which miscellaneous merchandise could be stored, but motor cars are large and square in shape and in order to store them efficiently and economically they must have a rectangular space, i. e., in certain proportions to the length and width of the cars.

If you had a square lot of equal area you could possibly crowd a hundred cars into it if they were not all large cars, but there are so many unsuitable corners here that you would be lucky to get eighty in, that is, of course, without having aisle space of any kind.

With aisles such as we show, about forty or forty-three cars can be stored and all accessible.

The construction of so many trusses all of different lengths and carrying capacity is one of the chief things making the erection of this type of building expensive. Usually the trusses are all exactly alike and it is very easy to cut the material and take measurements for all at one time, but here they must all be worked out individually.



No. 291

CEMENT STUCCO INSTEAD OF WOOD

Please publish plans for a one-story garage 50 by 125 ft., for general repair and acetylene welding. The location is good, being in a small town about twenty miles from any garage. I want an entrance at the front with office and display room for one car. I want the show case and accessories in office. I expect to have an engine with lineshaft to run air compressor, grinder drill, etc. in the rear I want a forge and anvil.

The roof of the building will be of the flat type but I don't want any posts inside. Publish a drawing of the cross beams to hold up the roof. Also show best arrangement of machinery and a nice front design. This building will be an all wood structure.—A. L. Presley, 2509 Harrison St., Kansas City, Mo.

Instead of an old wood building we suggest that you use Mill construction for your frame and cover it with stucco on metal lathe without wood sheeting. In this way you get a building that is as fire proof as the general run of garages and one that will require no painting and expensive upkeep. The stucco front will also be a great improvement over one of wood and will give your business a more firm and stable character.

We cannot take space to print or time to figure out the specifications of the latest truss shown but if your architect or builder cannot do it, you will find a table giving timber dimensions, etc., in Kidder's Architectural Handbook.



The Automotive Industry Ranks First in Beautiful Sales Buildings

ONE of the most unique and unusual automobile display buildings in the world, according to the designer, Henry Hornbostel, a noted New York architect, is being constructed in Atlanta for the E. R. Parker Motor Co.

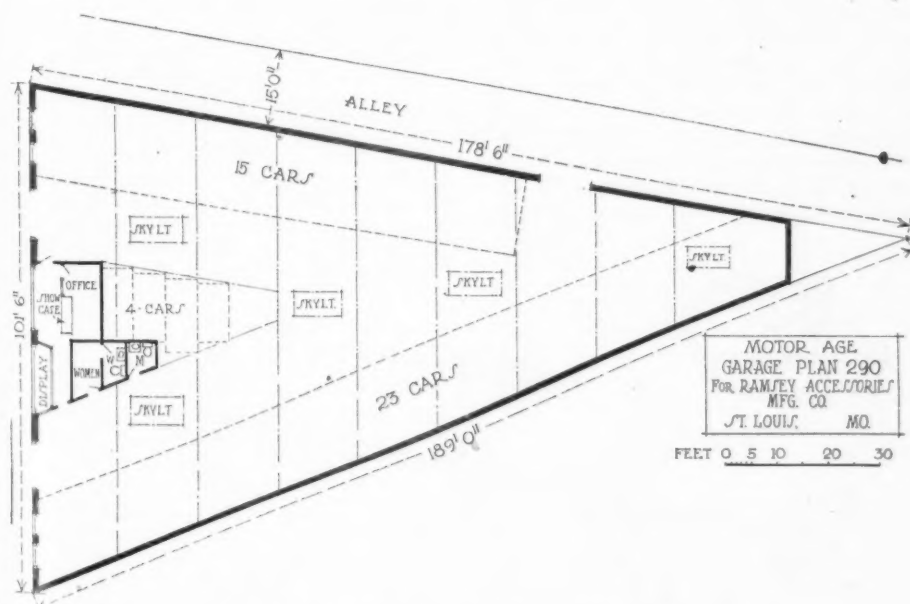
This structure will, in reality, be an immense show case, containing more plate glass than building material. It will be 100 by 62½ ft. The ceiling alone will be of about 20 ft. depth and with no supporting pillars inside. Outside the building will be 34 ft. in height. It will be divided into two 50 ft. sections, one side for Cleavelands and one side for Chandlers.

There will be six plate glass windows at the front and three at each side, the width of each window to be 16 ft. and the height extending almost to the top of the building itself. These windows will be in the form of arches. In addition to ample

light from the front and two sides of the structure, there is a long narrow building at the rear connecting the two larger buildings, and as this is only 16 ft. in height the window arches are extended above it at the rear of the display building, giving additional daylight from that direction.

Each car on the floor will be covered by a Japanese silk canopy supported by brass cranes, and which allows ample room for driving the car beneath the canopy. There will be one door leading into each section of the display building—that is, on the Cleveland and the Chandler side—and this door will be built through the central plate glass window.

The entire structure, including the executive building in the rear and the display building, represents an investment of about \$250,000.



No. 290—Triangular plot for public garage

Automotive Architecture

IN this department MOTOR AGE aims to assist its readers in their problems of planning, building and equipping service stations, garages, dealers' establishments, shops, filling stations, and in fact any buildings necessary to automotive activity.

When making requests for assistance please see that we have all the data necessary to an intelligent handling of the job. Among other things we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

PREPARE FOR OAKLAND SHOW

Oakland, Calif., Nov. 26—Preparations for the Oakland Automobile Show are being pushed forward. The yearly display of new models in the Eastbay city will take place in the Oakland auditorium during the week of Jan. 31 to Feb. 6. Robert Martland, secretary of both the California Automobile Trade Association

and of the Alameda County Automobile Trade Association, will again manage the Oakland Auto Show. The same show committee of last year will serve.

LOU H. ROSE STAGES DINNER

San Francisco, Nov. 26—Lou H. Rose, Chalmers and Maxwell distributor for the northern half of the state, was host at a dinner last week to the combined Chal-

mers and Maxwell dealer forces. With the addition of the Maxwell sub-distributors to his already strongly organized Chalmers dealers, Mr. Rose now has the largest dealer organization west of Chicago, it is said. The dinner was a real "get-together" and was in celebration of a most successful Chalmers year as well as of the acquisition of the Maxwell line.

The Readers' Clearing House

Questions and Answers

Designing a Testing Board

CONDUCTED BY ROY E. BERG
Technical Editor, Motor Age

THE question of a testing board for testing generators, starters and magnetos is one of pertinent importance to every dealer confronted with the problem of testing out the electrical apparatus he repairs. The thorough testing of the apparatus determines the lasting qualities of the repair, and the apparatus necessary to make the test is not very difficult to make. Such things as voltmeters and ammeters of course must be purchased. If a test bench is to be set up, then the wall type of laboratory instruments are the best for the purpose. The proper selection of these instruments is a difficult matter for the man not acquainted with electrical meters.

A voltmeter with several scales for different voltages should be selected. This type is more valuable, for it permits of battery voltage tests, dry cells voltage tests and with the high scale, line voltage readings, when they become necessary. The ammeter should be equipped with an external shunt, as this allows of greater flexibility in the adaptation to various scales. An ammeter does not depend on a shunted connection as does a voltmeter. Primarily an ammeter is a voltmeter but of milli-volt capacity. The deflection of the ammeter needle depends on the drop in the voltage of the current passing through a conductor, or more properly a shunt, of known resistance. With the correct ammeter several inexpensive shunts can be purchased, thus fitting the meter to read any current with a good deflection.

The instruments can be mounted on a panel of hardwood, or slate, if possible, as this makes a much neater board and reduces the fire hazard in case of short circuits. The instruments should be mounted on a level with the eye when standing before bench. Just below the meter a scale-changing switch should be mounted. The purpose of this is to shift from one scale of the meter to the other. The advantage of this can be seen when the voltage of a storage battery is tried on the 150-volt scale. A very small deflection will result and be so small as to be valueless, but if this voltage is read on the 15 volt-scale, the needle will deflect about half its full movement, which can be very easily read and with ten times the accuracy.

The connections of this switch are shown at 1-V in the illustration. The ammeter connection is slightly more difficult to arrange. The shunt should be

THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

placed immediately below the instrument. A shunt for a 1, 10 and 50-amp. current should be provided. One end of these three shunts should be connected together with an extremely heavy piece of copper. This will make the common connection for all three shunts. The other end of the shunts should be wired each to their respective places on the scale-changing switch, shown at 1-A.

ammeter come with the instrument. To the ends of these should be secured small copper tapered plugs that will fit in the holes which are drilled in the end of the shunt connection block. These shunts can be purchased from the meter manufacturer, and it is an easy matter to unscrew the binding posts and fit a tapered plug to the hole where the binding posts were. This will not make any difference in the operation of the instrument. The big advantage with this arrangement is that if the polarity of the connections are wrong for the instrument the small wires at the shunt can be interchanged without breaking the circuit with the possibility of producing a heavy spark.

The resistance panel can be a part of the board. It is best to place the lamps up overhead, as the glare of the lights will not interfere with one's sight. Six lamps should be enough to supply the necessary resistance. If more current is wanted, resistance units taking 5 amp. apiece can be obtained from an electrical supply house. Each lamp or socket should have its own switch. These can be small porcelain-backed switches or if a slate panel is used, the porcelain back can be removed and the metal parts of the switch lined up on the board itself. These switches should all be controlled from a double-pole, double-throw switch. The center connections of the switch, the

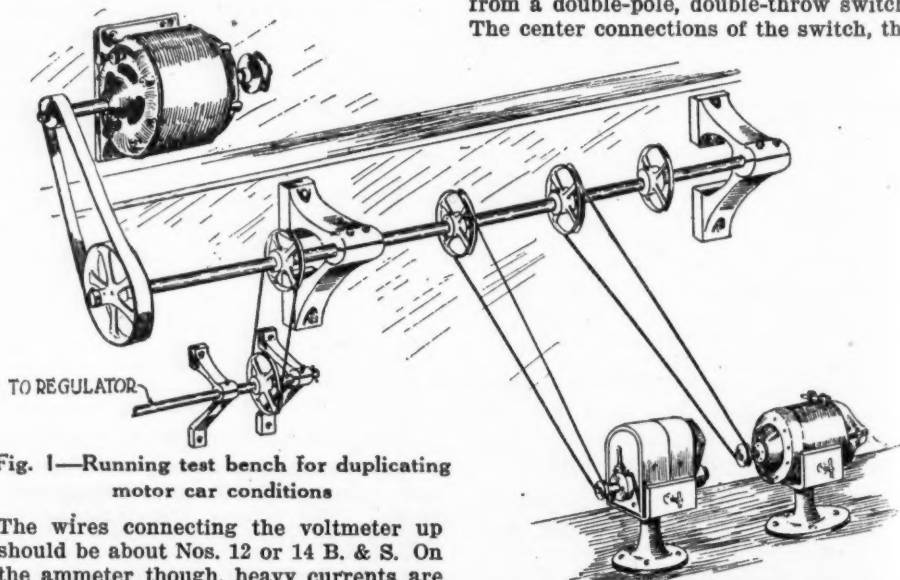


Fig. 1—Running test bench for duplicating motor car conditions

The wires connecting the voltmeter up should be about Nos. 12 or 14 B. & S. On the ammeter though, heavy currents are going to be carried, and since it is the current capacity that determines the size of the wire, these should be heavy, preferably of copper strip.

The wire leads from the shunt to the

ones from the switch blades, should be connected to the lamps, one side going directly to the lamps and the others to the lamps, but through the small single-pole single-throw switches.

An ammeter connection switch can be connected very well at the place shown. If an armature is being tested and it is desired to know the current passing through the armature, connect a wire from each side of this ammeter switch to the ammeter, open the switch, and the ammeter will indicate. The line voltage should be connected to the double-blade switch as shown. This leaves the other side of the switch for connecting in any generators being tested. One or two of

applied to the series winding using a light instead of a voltmeter. A is the test for open circuits. Place the test points at each end of the winding. If the lamp fails to light the circuit is open. To test for grounds place one point on the frame and the other on the terminal of the field coil. In making a test of this kind be sure that all of the ground connections that are regularly in use be removed. If the lamp lights it is an indication of a ground.

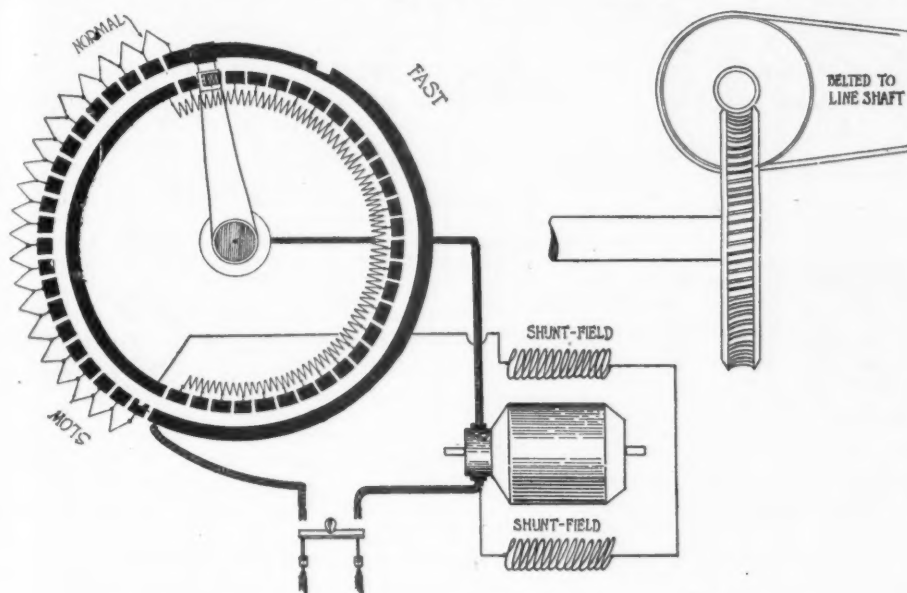


Fig. 2—Automatic operating switch for producing variable speed

the six lamp sockets can be of the small size to accommodate a 6-volt motor car lamp. It must be remembered that the switch controlling this lamp must be closed when the double-blade switch is on the 110-volt side.

An operating test under motor car conditions of all the machines repaired is also very valuable. At first it might be thought very difficult to duplicate the variable speed of a motor car engine, but such is not the case. It is not very difficult to set up a small line shaft and fit this with round belt pulleys to test out the generators and magnetos, and starting motors too.

To make the shaft-driving motor operate at variable speeds automatically it is necessary to drive the control switch from the line shaft. The control switch should be of the type illustrated with a field resistance and an armature resistance combined. By removing the handle stop the contact arm is allowed to make a complete revolution, necessary if the device is to be automatic. Then fit the center control shaft of the switch to a small worm wheel, and this can be driven from a worm off the small pulley drive illustrated. The connections for the motor and the switch are shown.

TESTING WINDINGS

Q—How would you test out the series winding of a starting motor without a volt meter?

3—How can a generator revolving clockwise be made to revolve counter clockwise?—T. H. Wall, 43 Seldon Ave., Detroit, Mich.

1—Fig. 6 shows the tests that can be

To test for a short circuit between the series and shunt windings, place one test point on the terminal of one of the

Where You Will Find the Answer

To assist readers in obtaining as a unit all information on a certain subject, **MOTOR AGE** segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

Electrical

T. H. Wall.....43 Seldon Ave., Detroit
W. R. Vickrey.....Hico, Texas
John T. Garfield.....East Jaffray, N. H.
Jesse Steward.....Roanoke, Texas
J. H. Brown.....Battle Creek, Mich.
J. L. Gibson.....David City

Miscellaneous

Noel Bouaa.....Coulterville, Ill.
R. McNamera.....Dublin
John L. Lee.....Lake City, Iowa
V. D. M. M.....Waterbury, Conn.
Sims Motor Service Co.....Springfield, Mo.
James Williams.....Turley, Okla.

Engines

Rollin A. Richmond.....Springfield, Mass.
A. Hickman.....San Antonio, Texas
G. J. Blancett.....Lassen Co., Calif.

windings and the other point at one of the terminals of the other winding. If the lamp lights there is short between the windings.

2—The necessary changes to be made when reversing the direction of rotation of a generator was outlined in the Nov. 4th issue of **MOTOR AGE**.

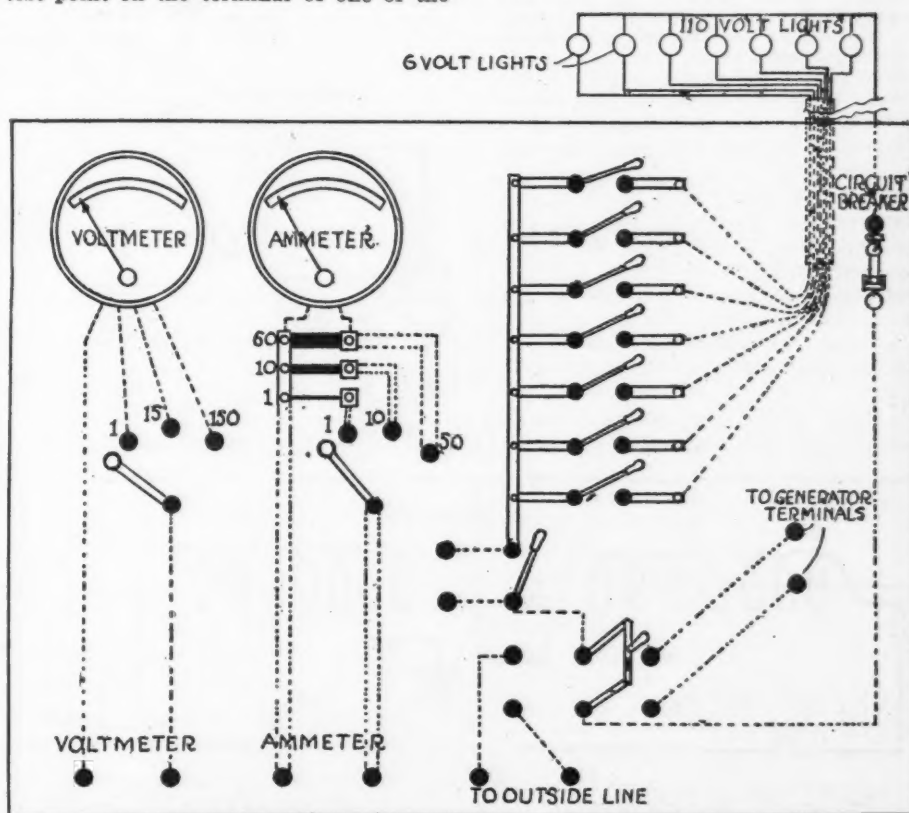


Fig. 3—Design for test switchboard. The lamps are the resistance units and can be used for charging batteries. The two first lamps on the bank are 6-volt lights to be used for generator work

BRISCOE WIRING DIAGRAM

Q—Publish wiring diagram of a Briscoe eight thirty-eight, 1915 or 1916 model. Has but one generator for starting and lights.

2—Give name and address of a foundry or smelter who would likely buy scrap copper.—W. R. Vickrey, Hico, Texas.

1—The Splitdorf Apelco system which was used on the 1916 Briscoe 8-38 is shown in Fig. 7.

2—Any of the following companies will buy scrap copper: Bunting Brass and Bronze Co., 740 Spencer Street, Toledo, Ohio; Atlas Brass Foundry Co., Columbus, Ohio; Ashland Brass Foundry, Ashland, Ohio.

AMMETER INSTALLATION

Q—Publish diagram showing how to install an ammeter on 1915 4-cylinder Buick, equipped with the Delco Electrical System.—John T. Garfield, East Jaffray, New Hampshire.

Fig. 5 is the wiring diagram showing the ammeter installation. In selecting an ammeter for this purpose, a dead beat type should be chosen that will have a charge and discharge range of about 30 amperes. To install the ammeter, first remove the wire from the number 1 terminal on the back of the combination lighting and ignition switch; connect this wire to the negative terminal of the ammeter and from the positive terminal of the battery connect a similar wire to No. 1 terminal on the switch. When the ammeter is connected as explained above it will show both charge and discharge rate of the storage battery.

CITY LIGHTING PLANT

Q—We are installing a 110-volt lighting plant to supply current for the city and intend to use a 56-cell battery in a parallel to take the load after midnight. An automatic cutout between battery and generator will have to be made. Explain how the wiring should be done.—Jesse Steward, Roanoke, Tex.

There are on the market a great many different types of reverse current relays and cut-outs so that it will hardly serve a purpose to publish a diagram for this. The General Electric Co., Schenectady, N. Y., the Westinghouse Electric Co., Pittsburgh, Pa., the Cutler Hammer Co., Milwaukee, Wis., or the Roller Smith Co., Woolworth Bldg., New York, can undoubtedly supply you with a cut-out and reverse current relay. We are suggesting a means by which you can accomplish the same result which is shown in Fig. 8.

We have shown the generator as a compound one, and connected to the load

through a double throw double pole switch. The circuit breakers are connected in above this switch. By throwing this double pole double throw switch to the left side the generator will be connected to the line and the batteries will off the supply circuit. Then by throwing the smaller double pole switch the current from the generator will flow into the battery at the same time and

thus charge the cells. When the batteries are connected for the night load, the double pole double throw switch is closed to the right which connects the batteries to the line. The small switch is opened to the right which connects the batteries to the line. The small switch is opened at the same time which will prevent the battery current from flowing back through the generator.

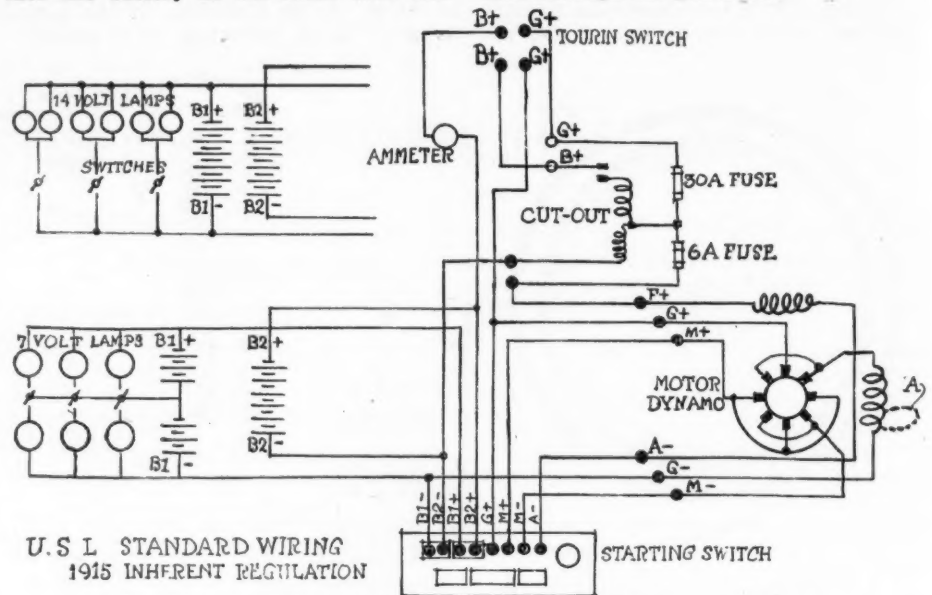


Fig. 4—U. S. L. Standard wiring diagram—1915 inherent regulation

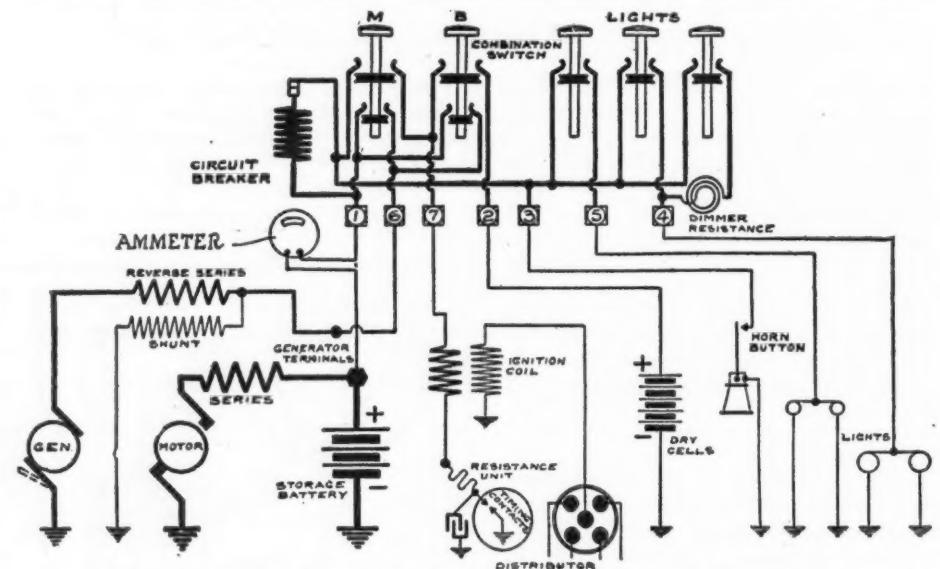


Fig. 5—1915 Buick wiring diagram showing ammeter installation

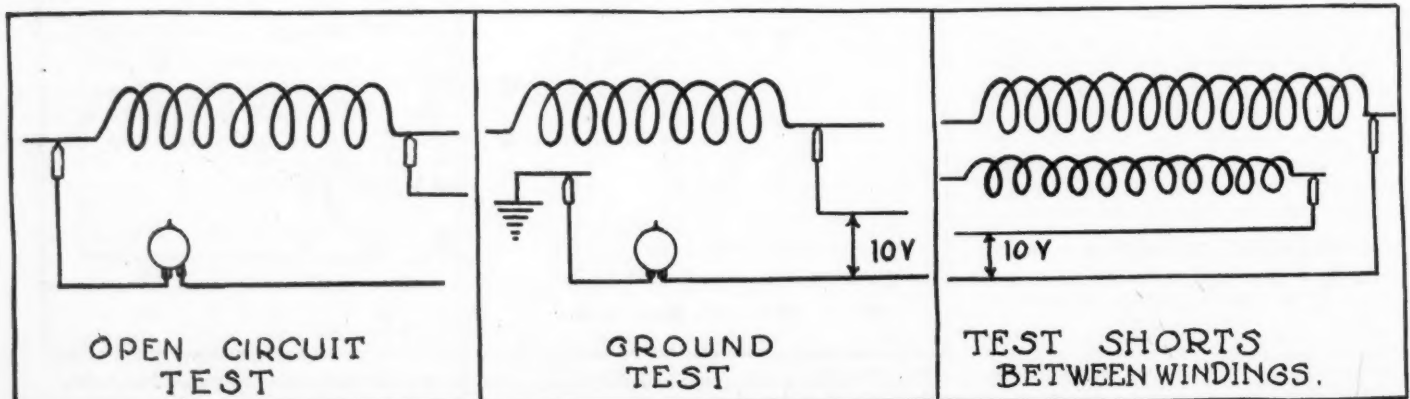


Fig. 6—Showing tests applied to series winding using a light instead of a voltmeter

U. S. L. BATTERY

Q—A 1916 model 29 Master Six Chalmers has been kept in perfect running order and looks like new. It has a new USL 18-volt battery and a Chalmers-Entz starter. The Weston ammeter shows that the battery gets only 5 to 6 ampere charge when the car is running 20 to 25 m. p. h. The U. S. L. battery expert here has tested the generator and found no short circuits anywhere. The armature is all right and the brushes have a good clean contact. The new battery was removed and the old battery put in again and it was found that the generator charged the battery at the rate of 8 to 10 amperes.

Another new USL battery was installed and the rate of charging dropped to 5 or 6 amperes. In fact, both new batteries would run down after a few days to half charge and it was necessary to drive at a high rate of speed to indicate 8 amperes on the ammeter dial. The generator does not charge the new battery enough. It should be about 11 amperes with the engine running 12 m. p. h. How can this be accomplished?—J. H. Brown, Battle Creek, Mich.

Every condition as described by you is the most natural thing for the electrical system to do. When you put the new battery in, the current charge rate dropped because the voltage of the generator was not enough to overcome the higher voltage of the new battery, consequently the charge rate dropped. With an old battery the opposition from the battery is less, consequently the charge rate is higher.

The regulation used on the generator of this car is of the type designated as a bucking field coil or, technically, a differentially wound generator. In this type of generator the opposition of the field flux created by the series winding is just enough to keep the charge rate constant as the generator speeds up. More specifically, the current which flows from the generator passes through a coil which is arranged around the field poles, so that the current in flowing through the coil passes through in a direction opposite to that of the shunt winding.

This action sets up a field flux which opposes the flux as set up by the shunt field winding. When the generator is moving slowly, the counter flux produced by the reverse series field is very little, naturally, because there is very little current flowing. As the generator speeds up, the current tends to rise but is held back because the opposing flux of the differential field holds it back. Now there is only one simple way to increase the charge rate of the generator on your car. This is by shunting out part of the series field winding. You will note in the diagram, Fig. 4, how this is accomplished. The generator is shown as combined with the starting motor. The series winding is that winding to the right of the armature. It will be noticed that a dotted line is drawn around one coil of this series field. This represents the shunt connector which will reduce the opposing effect of the series field and therefore allow the voltage to build higher, which will increase the charge rate.

REVERSE BATTERY POLARITY

Q—Is it possible to tell when a storage battery has been charged backwards, without opening the battery? If so, how?—J. L. Gibson, David City.

A storage battery when charged in the reverse direction will exhibit under capacity tendencies immediately. In

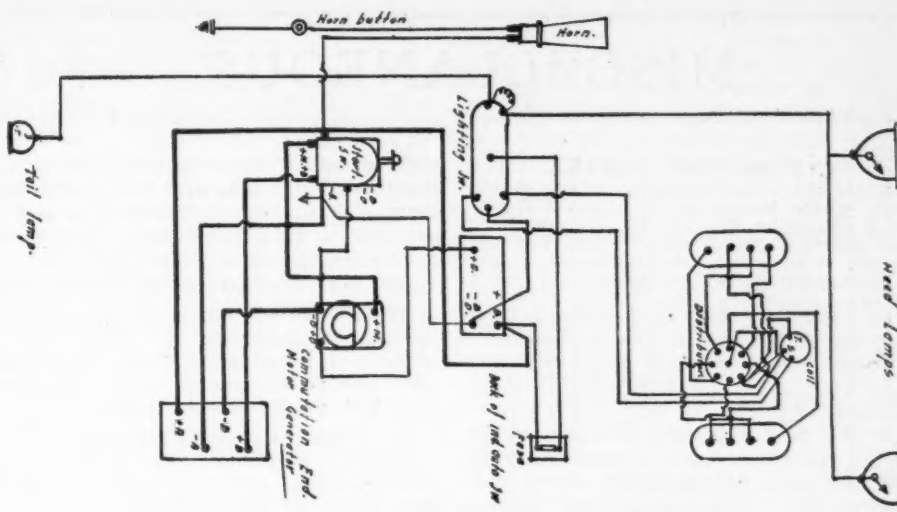


Fig. 7—1916 Briscoe wiring diagram

fact, a battery charged in the reverse direction will hardly have sufficient capacity to turn an engine over. If it should have been charged with reverse polarity sufficiently long, the capacity might be enough to turn the engine over but a second attempt will not exhibit the under capacity of which we speak. Also, the battery will heat up and the water will evaporate very rapidly when the battery has been reversed in polarity.

COIL RESISTANCE UNITS

Q—The resistance on top of some Atwater Kent ignition coils burns out. What kind of wire is it made of and how much should be used on 12 and 6 volt coils?

2—How many amperes should a coil draw from a battery?—A Reader, Hopkinsville, Ky.

1—We do not know what kind of wire is used for the resistance units but the resistance used for the six volt coil is

about 3 ohms. The advisable thing to do is to remove one of the units from a good coil and measure the resistance and then supply the required amount to each of the coils.

2—A coil will not draw more than approximately one ampere.

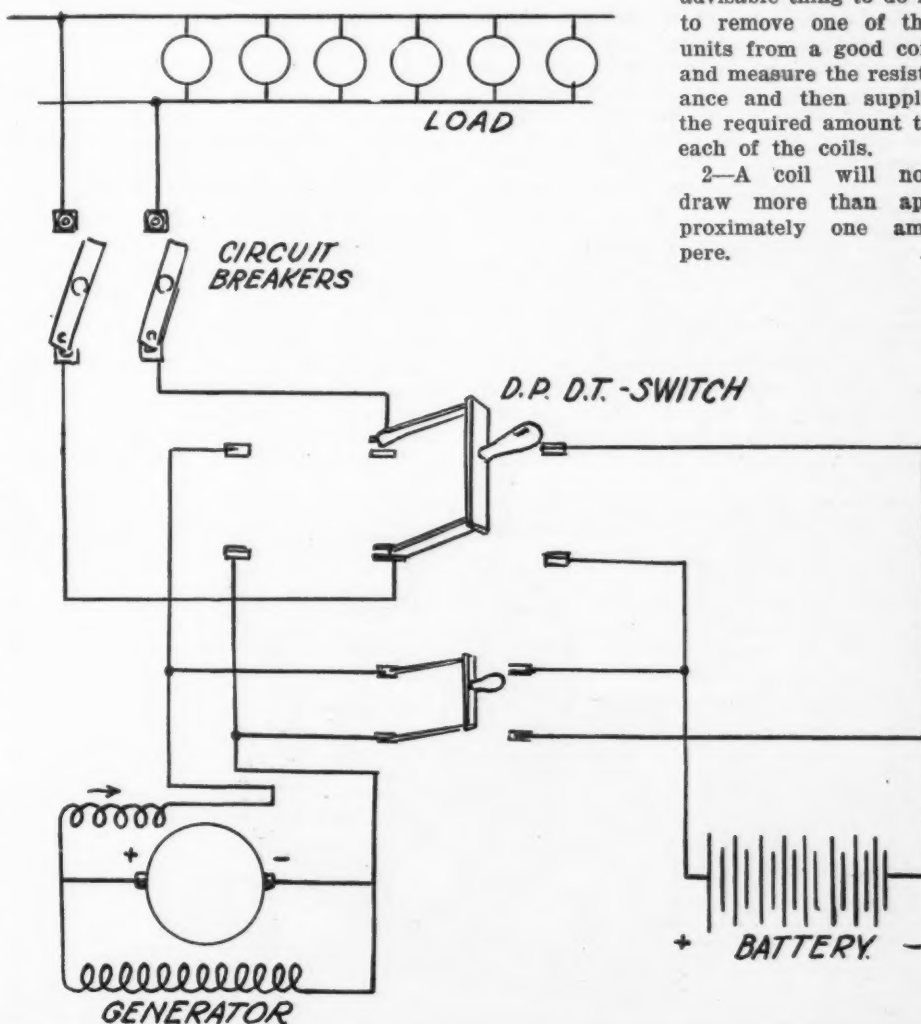


Fig. 8—City lighting plant diagram

MISCELLANEOUS

CLUTCH CONE BREAKS

Q—Is the breaking away of the clutch cone where bolted to withdrawal flange on a Chevrolet 490 due to ill luck or is the gearbox out of line? This has occurred twice; after the first break a new cone was fitted but it subsequently broke in the same place.

2—The engine supports seem lower than they should be. Advise how to determine whether engine is out of line with gearbox, or the best method to prevent further breakages at this point?—R. McNamara, Dublin.

1—We do not believe that the breaking of the clutch cone is due to ill luck but that there is some real reason why the trouble is occurring. We believe that the trouble is caused either by a sprung crankshaft or by the transmission being slightly out of line. Perhaps the sprung crankshaft theory is the most plausible. Unless the car has had a very severe jolt the transmission would not be out of line but should some severe strain be imposed on the car, this might be the trouble as you suggest. If at some time a connecting rod bearing has burned out while the engine is running it is more than probable that the crankshaft is sprung. At any rate we suggest that this member be tested for proper alignment.

2—To see whether or not the short shaft between the engine, clutch and the transmission is out of line examine it for any misalignment. When the engine is idling with the clutch in and gearshift in neutral position there should be no eccentric motion to this shaft. If there is, this is probably the reason for the trouble.

GRINDING CYLINDERS

Q—What would be the best way to fit piston rings, with cylinders ground to size, or nearly to size, and lapped pistons and rings in, or to burnish piston in cylinders?—V. D. M. M., Waterbury, Conn.

If the equipment is available you will get just as good a job by regrinding as it is possible to get. Of course, if you are going to use the cylinders in an engine designed for racing or extreme

high speeds it may be better to grind them nearly to size and then hand lap them. But, commercially speaking, grinding is very satisfactory. In fact, a good reground job is better than a poorly lapped job. We know of one famous race driver who at one time reground his cylinders and then ran the engine for a while with brass polish in the crankcase oil. The result was a set of cylinders that had a mirror-like surface.

HUP OILING SYSTEM

Q—What model and year is a Hupmobile 4 Cylinder Roadster, serial No. 14142? Also oiling system of the motor?

2—Where can repair parts be obtained?—Noel Bouas, Coulterville, Ill.

1—This car was built in 1916 but we cannot tell what model it is. We shall assume that it belongs to the series N. Fig. 9 shows the engine lubricating system. The cylinders, connecting rods, crankshaft bearings, camshaft bearings and all parts within the crank case and cylinders, as well as the push rods and valve stems, are lubricated either directly or indirectly by forced feed. The oil is picked up from the bottom of the crankcase oil pan by the flywheel and is thrown with force into a pocket at the upper side of the crankcase from which it is forced to the oil distributor manifold after passing through a strainer.

The oil is then forced from the main distributor manifold through ducts in the crankcase to each of the main bearings. It is then carried under pressure through oil ducts drilled in the crankshaft, from the crankshaft bearings to the lower connecting rod bearings. The oil is then forced from the lower ends of the lower connecting rod bearings into the crankcase in the form of a spray, which lubricates the camshaft bearings, pistons, piston pins, and cylinder walls.

A small supply of oil, instead of going through the main manifold branches off after being strained and enters the oil tight valve tappet compartment on the left side of the engine. Two stand pipes

automatically regulate the height of the oil in this chamber so that the oil level is just above the top of the valve tappets. A baffle at the rear end of the oil pan just forward of the flywheel prevents splashing of the oil. After leaving the flywheel, all oil passes through the strainer assembly before again entering the distributing manifold.

2—Repair parts can be obtained from the Hup Motor Car Co., Detroit.

OVERLAND AXLE ADJUSTMENT

Q—Instruct how to adjust the ring gear and pinion gear on an Overland 4.

2—Describe the bearings and gears in the rear axle system. Publish illustration showing adjustment.—John L. Lee, Lake City, Iowa.

1—The axle used on this car has one adjustment of the rear axle gears, which is for the movement of the pinion gear. It is possible on this car to make a measurement which will tell whether or not the rear axle gears are properly adjusted. This measurement is as follows: The distance from the face of the torsion tube rear axle flange to the face or the small end of the pinion should measure the same as from the face of the rear axle flange to the edge of the small end of the bevel drive gear tooth. In order to measure this distance correctly it may be necessary to remove the right side of the rear axle housing after which one may adjust the pinion gear to any desired position.

2—The gears used in the rear axle of this car are of the spiral bevel type. The pinion or small gear is slipped over the end of the rear of the propeller shaft being fitted to a taper connection where it is keyed in place. A large castle nut is screwed to the rear end of the shaft for the purpose of further securing the pinion gear to the shaft.

A right hand thread is used on this nut. The ring gear is secured to the differential spider by rivets. There are forty-five teeth on the ring gear and ten on the pinion. The gears carried inside of the differential spider housing have twelve teeth on the pinions and twenty-four on the driven gears. There are four pinion differential gears. The ball bearings on each side of the differential carrier are ball bearing type and are arranged to take the side thrust of the ring gear and pinion.

NOT SUFFICIENT HEAT TO WELD

Q—In making a weld on a steel rod about 1/4 in. I can melt the bottom of the bevel and run them together and fill it up but when it cools can pull it apart. It doesn't seem to have fused and run together at all and seems to have slightly stuck. The melted metal forms blisters as it fuses, and after cooling it can be powdered up like coarse sand.—Sims Motor Service Co., Springfield, Mo.

You are not getting sufficient heat to the weld. Just as in soldering, you must get the surrounding parts heated to a high enough temperature to insure the flux and welding material acting uniformly. You probably melt the welding rod all right, but the surrounding parts are not heated enough to insure permanent union. If you had a welding outfit, either of the electric or oxy-acetylene type, we feel sure your difficulty would be overcome. Of course, the right flux is essential in any kind of welding.

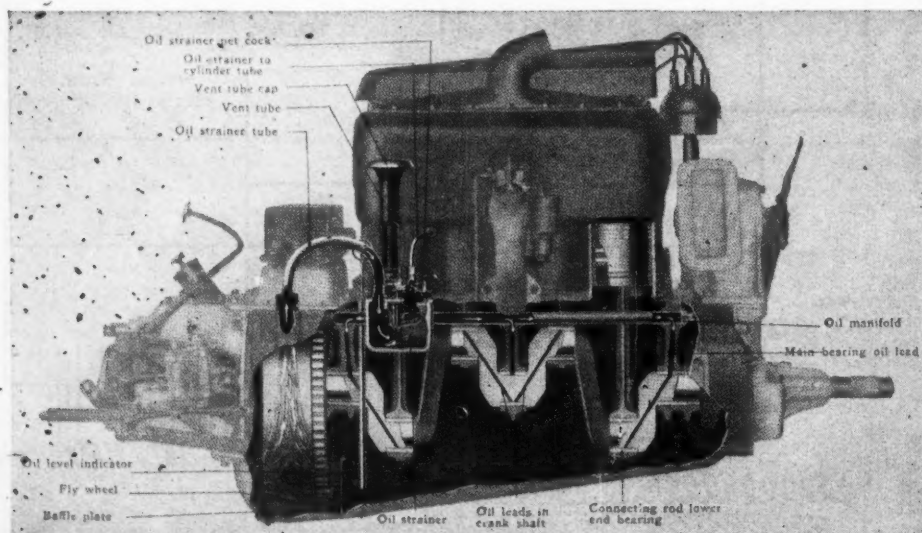


Fig. 9—Oiling system of Hupmobile engine, series N

ENGINES

JEFFREY VALVE LINING

Q—Please publish the valve timing on a Chesterfield Jeffrey six cylinder. What speed should this car make with four speeds forward?—James Williams, Turley, Okla.

1—The cam and crankshaft gears are set and marked with figures on each gear and when the shafts are placed in the proper position the two numbers should fit one on top of the other. To see if the engine is in time, turn the flywheel until the center punch mark on it coincides with pointer projecting over the flywheel, and the piston in the cylinder that is being timed is ready to start downward on its intake stroke.

Turn the flywheel until the pointer corresponds with the marking Exhaust Valve Closed. At this point the exhaust valve should be entirely closed. There should be just enough room to draw a piece of paper between the valve stem and push rod. Move on to the point marked Inlet Valve Open. At this point the inlet valve should begin to open and a piece of the writing paper between the inlet valve stem and the push rod should begin to tighten. Exhaust valves are timed Nos. 1-9-6-12-4-8. The inlet valves Nos. 2-10-5-11-3-7.

LE RHONE ENGINE

Q—Why is an odd number of cylinders used in a rotary gasoline engine of the four-cycle type?

2—Does the same principle apply in the two-cycle type, or would an even number give the required results?—Rollin A. Richmond, Springfield, Mass.

1—Engine of the Le Rhone type are made with an odd number of cylinders in order to coordinate the firing order. In engines of this type where all cylinders act upon one crankpin and where the firing impulses occur at right angles it is essential that there be an odd number of cylinders. This may be explained by the two illustrations, in Fig. 10.

These figures are for a nine cylinder and an eight cylinder radial engine. If the engines were arranged to fire consecutively, it is clear that all the cylinders in either case would fire in one revolution. The next revolution would then be an idle one as far as producing power is concerned. To overcome this intermit-

tent action it follows that the cylinders must not fire consecutively, but at the same time they must fire with regular intervals between each impulse. Therefore, with the nine-cylinder arrangement it will be seen that as alternate cylinders fire, it is possible to complete the two revolutions with nine equally spaced power strokes. If we take the eight-cylinder arrangement and fire alternately, one preferred firing order would be 1-3-5-7-2-4-6-8-1, etc. From this it will be seen that the interval between 7 and 2 is $1\frac{1}{2}$ times the average interval between 8 and 1 the interval will be only $\frac{1}{2}$ times the average interval.

With the odd cylinder arrangement the firing order would be 1-3-5-7-9-3-4-6-8-1 etc. from which it is apparent that all intervals are equal and regular.

2—With a two-cycle engine all the power strokes could be made to occur during one revolution. Therefore, if the cylinders fired consecutively either odd or even arrangement of cylinders could be used.

MITCHELL ROADSTER

Q—A 1921 Mitchell roadster overheats. The valves have been checked and advanced, the ignition checked several times and retimed, an air pocket tube from pump to cylinder installed, the thermostat removed, and a new ring and two cylinder head gaskets installed. With the hope of enriching the carburetor a new No. 2 metering pin was put in but a sluggish carburetor is the result. The motor has no pep, yet the radiator seems to be in excellent shape, the water circulation is apparently perfect and the oil pump works. What is the cause and remedy?—A. Hickman, San Antonio, Tex.

On this engine the water pump is driven by the fan belt. It sometimes happens that the fan belt becomes loose and, therefore, allows the water pump to be driven in a haphazard manner. We advise that this be checked first since it is so easy to examine this unit. Of course, installing a larger metering jet in the carburetor did the overheating proposition no great good for this would tend to make conditions worse rather than improve them. We advise that the same metering jet be replaced.

The installation of two cylinder head

gaskets would tend to reduce the heating somewhat but it is a procedure that should not be adopted unless the engine is inclined to knock heavily on hard pulls. Installing two gaskets will reduce the compression pressure and will, consequently, reduce the engine's power. Therefore, we suggest that only one gasket be used, unless, of course, as we said before, the engine is inclined to knock.

Be sure that in the place where the thermostat was installed a too small connection has not been used. If the tube or whatever you used to fill the gap in the hose connection is of too small a diameter there will be an unnecessary restriction which will cause the engine to overheat.

The spark timing is one of the most important things to consider but since you say this has been thoroughly checked this possibility is removed.

BOSCH MAGNETO

Q—Can a Bosch magneto be installed on a 1917 Studebaker $\frac{1}{2}$ ton truck without much expense for fittings?

2—Would an extension from the pump shaft do, or does it turn too fast?

3—Why does the carburetor on this truck squirt gasoline all over when the switch is off?

4—What are Zig Zag valves?

5—What is the difference between regrinding a cylinder and reboring a cylinder?

6—How many different firing orders are there in six cylinder engines? Name those most used.—G. J. Blancett, Lassen Co., Cal.

1—Special work of this kind always runs into money. Unless an engine comes with a base for a magneto drive and has other fittings that will insure ease of installation, it is best not to attempt work of this kind. You may start something and not know how far you will have to go.

2—If you can arrange to drive the magneto from the pump shaft this will be all right, as it travels at half engine speed.

3—We don't know just what you mean. If you mean gasoline drips from the carburetor when the engine is shut off, it indicates a leaky float valve. Sometimes tapping the float chamber with a hammer will overcome the trouble. Grinding in the float valve with a little pumice will help also. If the float is punctured or gasoline soaked in case of a cork float, a new one is necessary. Also make sure you do not run with the choke partially out, as this will cause the engine to suck a lot of raw fuel into the manifold.

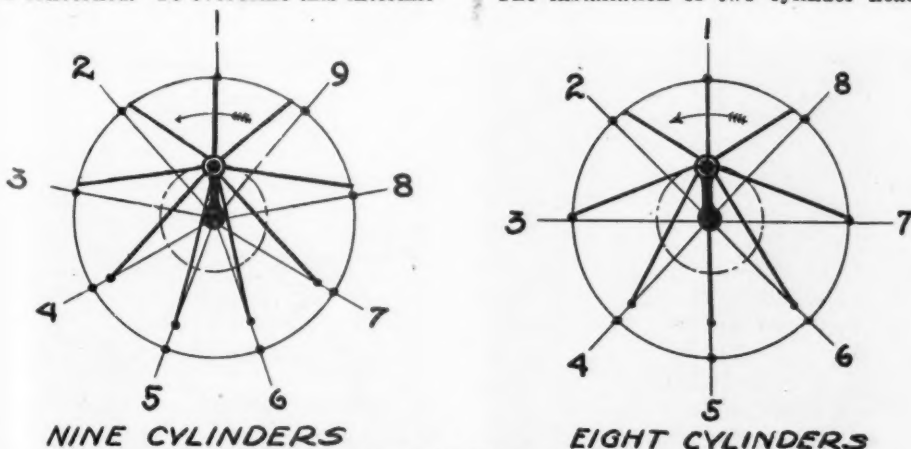
4—This is the trade name for a valve made with a laminated construction.

5—In reboring a cylinder a steel cutter is used, while in regrinding an emery or carborundum is used.

6—There are eight possible firing orders for a six-cylinder engine; these are:

- | | |
|-----------------|-----------------|
| (1) 1-2-3-6-5-4 | (5) 1-4-5-6-3-2 |
| (2) 1-2-4-6-5-3 | (6) 1-5-4-6-2-3 |
| (3) 1-3-5-6-4-2 | (7) 1-4-2-6-3-5 |
| (4) 1-3-5-6-4-2 | (8) 1-5-3-6-2-4 |

While many of these firing orders will give good results there are problems to face in the distribution of incoming and outgoing gases, so that the last two firing orders given are the ones in general use.



NINE CYLINDERS

EIGHT CYLINDERS

Fig. 10—Diagram showing why the Le Rhone engine uses an odd number of cylinders

The Accessory Show Case

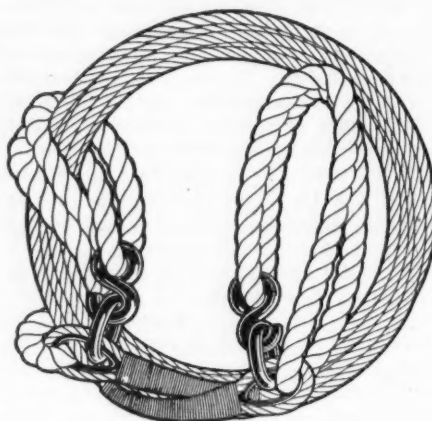
New Fitments for the Car

Edstrom Tow Line

The Edstrom tow line manufactured by the Edstrom Machinery Co., Cary Station, Ill., is made of special steel wire designed to be non-kinking. Tests made on this line by authorities have proved the extreme difficulty of producing a kink in it. The line weighs but 3 lbs. A manila hemp loop is provided with a quick attachment hook and eye used to secure to the axle or other parts of the car. The eye splices of this cable are machine wrapped on a special wire wrapping machine that this company employed during war times in making airplane cable. Other wire line articles are made by the same company. The tire lock is wrapped in identical manner with the tow-line. A heavy leather sheath surrounds the tire lock which prevents it from marring the body surface.

Parker Anti-Skid Units

The Parker anti-skid unit is a device which can be permanently placed on the spokes of rear wheels of motor trucks, for the purpose of attaching strands of chains to prevent skidding. The pliable metal clamp is drop forged, and is made to conform to size and shape of spoke. The hook is drop forged and the steel anchor turns without use of tools to the locking position. This device is adjustable to the spoke in both directions and but two sizes are required to fit all



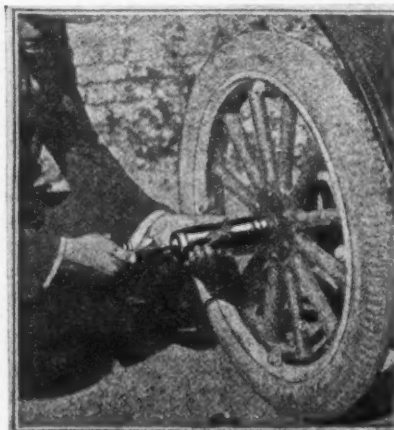
Edstrom tow line

spokes of trucks from one-ton to seven-tons capacity.

Both end links of the chain attach to the same hook which sets on the outside of the spoke, making the attaching of chain a clean operation. These units are manufactured by Parker Morse Co., Cincinnati.

Ward Windshield Visor

A windshield visor of rigid construction has been put on the market by the E. T. Ward Mfg. Co., Oak Park, Ill. The Ward visor is reinforced at the upper end by an inserted wood strip to prevent sag and at the lower end by an inserted steel rod which is finished off at both ends by neat appearing knobs. The upper, or wood strip end, is attached to the eave of the car by means of four wood screws. The rod is supported by two black japan finished cast brackets which are so designed as to stretch the material on all sides, making it smooth and taut. This visor is also equipped with a curtain of heavy motor car leather. It is made for various makes of cars and retails at from \$8.50 to \$10.



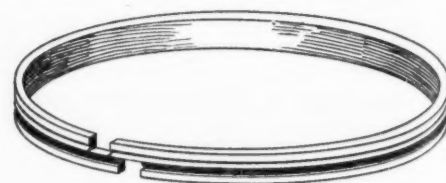
Forc-Ful lubricator applied

Forc-Ful Lubricator

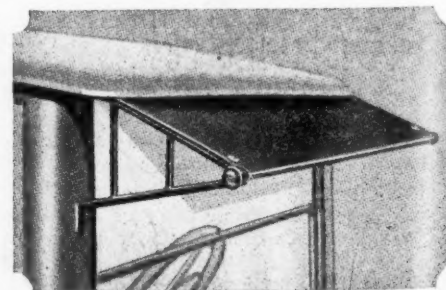
The Forc-Ful lubricator is a lubricating system for the chassis of the Ford car. It includes a high pressure lubricator force gun and special connections for every position on the Ford car, including the front wheels. The high pressure gun has a rigid connection with the connector which makes it unnecessary to soil one's hands when connecting the gun to the point to be lubricated. This outfit is manufactured by the I. C. Manufacturing Co., Chicago, having its sales department with The Zinke Co., 1323 Michigan Avenue, Chicago. The outfit lists at \$7.75 complete with all connections.

The Master Ring

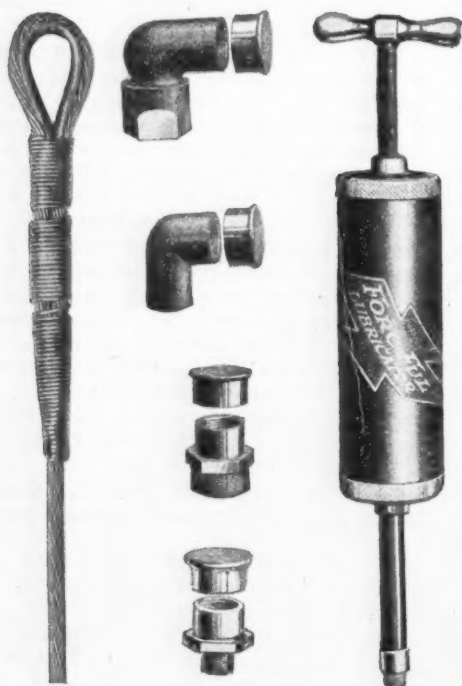
In the design of the master ring two distinct and large reservoirs are established from the fact that the ring has been made with a high central section and two V cuts which have been turned on a lathe. It is claimed this ring is the only one offered to the trade that is lathe turned instead of ground, meaning necessarily a soft and uniform iron. Each ring is individually turned. Through the use of a high central section the valve of lap joint is preserved. It is claimed that the oil which collects in the grooves not only diminishes the escape of gas but prevents the leakage of oil into the cylinder head. Inasmuch as the ring is actually moving at all times on a small film of oil it is said friction is greatly reduced and the efficiency of the engine increased. Prescott Auto Parts Co., Webster, Mass.



Master piston ring



Ward windshield visor



Left—Edstrom tow line
Right—Forc-Ful lubricator and connections

Service Equipment

Time Savers for the Shop

Dial Cylinder Gage

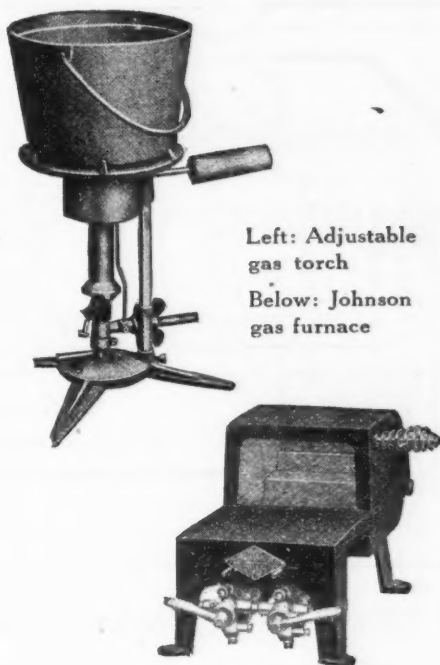
The cylinder gage is designed for the calibration of gas engine cylinders, or for any hollow work of a similar nature, where extreme accuracy is required. If your cylinder is large or small, out of round, or it is not straight, this gage will show the error to less than a quarter of a thousandth of an inch, and it is claimed will accomplish this in about one-tenth the time required by any other method. This instrument is a gage head set in a mounting, two points of which are fixed and the third, which connects directly with the hand on the dial, is movable and shows the error. With this gage, the B. C. Ames Co., Waltham, Mass., advise the use of a ring as shown. This ring, which the company does not furnish, should be machined the size you wish to grind your cylinders, and, in fact, it becomes your reference gage. The cylinder gage is placed in this reference ring and rests on slides B and C. Point A is movable and actuates the hand dial, and with points of varied lengths, cylinders of different diameters can be accurately measured. The capacity is from 55 mm. up and the instrument is graduated to read .001 in.

Hyrate Electric Oven

For drying armatures, field coils, etc., in electrical repair shops, the Service Station Supply Co., 30-32 E. Larned Street, Detroit, have placed on the market the Hyrate electric oven. The manufacturers claim that no labor is required while the battery is being heated, and the cells are heated rapidly and evenly without burning or charring the tray or rubber parts. Thus danger from explosion of ignition gases in the cells is eliminated. With the Hyrate electric oven the external solid parts of the battery



Dial cylinder gage



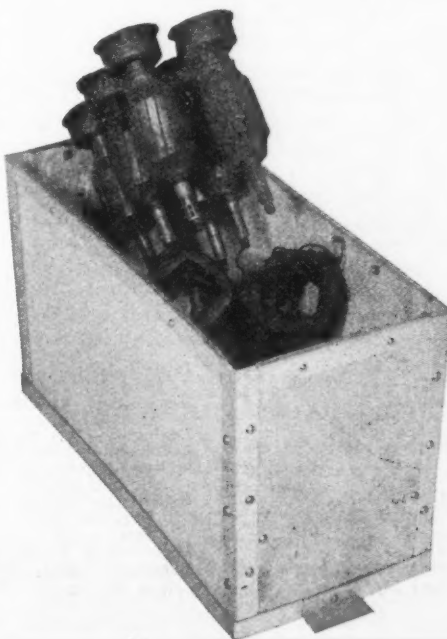
Left: Adjustable gas torch

Below: Johnson gas furnace

are thoroughly heated before the solution rises in temperature so that plates are not injured by the heat.

The Hyrate electric oven is manufactured in two types, one for from 110 to 125 volts, and the other from 220 to 250 volts. It will operate on either direct or alternating current.

A handle is mounted on either end of the oven so that it can be tipped either way to inspect or remove battery. This oven sells for \$38.50.



Hyrate electric oven

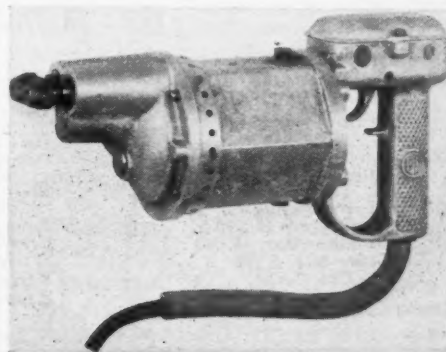
Two-Spindle Drill

For drilling holes in the Murphy top fastener, the Black & Decker Mfg. Co., Baltimore, have designed a two-spindle drill. The Murphy fastener is used for attaching automobile side curtains and when the base of the fastener is put on the automobile body, two holes, $\frac{1}{8}$ in. apart, are necessary, which operation this new drill is claimed to perform accurately in one operation. The handle of the drill resembles an automatic pistol and a pull on the trigger sets the two drill bits in motion. A second pull stops the drill and in this way the operator can control the tool without changing the position of either hand. According to the manufacturers this tool is exceptionally light and by holding it with the forefinger on the trigger the operator is able to drill at the same time two holes $\frac{1}{8}$ in. apart and $\frac{3}{8}$ in. apart.

Gas Soldering Furnace

The Johnson gas furnace will, according to the manufacturers, successfully handle soldering coppers up to 10 lb. a pair. It is equipped with two independent burners that have a shut-off valve and pilot light, and is claimed to produce instantly a heat of 1800 deg. Fahr. in the fire-box. This furnace can also be used for heat-treating small carbon steel tools such as dies, gears, taps, reamers and chisels. Its gas consumption about 12 cu. ft. an hour to the burner. It sells for \$14 and is manufactured by the Johnson Gas Appliance Co., Cedar Rapids, Iowa.

Another product of the Johnson Gas Appliance Co. is an adjustable gas torch which can be used for melting lead, babbitt, solder, zinc or tin. It is claimed to quickly melt small quantities of soft metal without the use of a forced air blast. The burner may be removed from the stand and used as a hand torch and the shield may be removed and the top used to hold soldering coppers or any article that is to be heated. This torch weighs $9\frac{1}{2}$ lb., is 14 in. high with a 10 in. base. The price, with pot, is \$10.



Two-spindle drill

Law in Your Business

By Wellington Gustin



Possible Laws Imposing Limitations Upon Present Free Entrance Into Garage Business

IN a former article we promised to discuss the regulatory power of city and state over garages. The great financial law of property is that one may do what he will with his own; and equally as important is the rule of personal liberty, that one may enter into any pursuits of livelihood that he wills to. Even these broad principals however are subject to numerous exceptions. A general statement would be that one's freedom of action is limited to that point where it interferes with the rights of another. One's freedom, then, in a complex society, must be regulated for the benefit of society in general and the community in particular.

At the present stage of the automobile industry any person may enter into the garage business freely and without interference from the state. It does not require that he be an automotive engineer or an automobile mechanic; much less requiring that he present certificate of education, training or experience, together with affidavits as to good moral character, before being admitted to an examination as to his fitness.

LACK OF COMPETENT SERVICE UNDER PRESENT FREE SYSTEM

The ease of getting into the business excludes it only to the man lacking the necessary capital or credit. Of course, under such conditions the public suffers for lack of competent and high grade service. Perhaps it is offset by other advantages of our present free system. Some large communities lament the fact that out of their several garages there is not a real automobile mechanic of ability. There have been numerous complaints—many reaching the courts, where garages have done more harm than good in attempting to repair an automobile.

The trouble has been lack of competent trained help. Perhaps some service is better than no service and to restrict entrance into the business would be to reduce the number of garages and repair shops resulting in delays to the general public. But if trained and skilled help is needed there should be some one to train the worker in the shop.

If, as in many cases, one buys a garage, having no knowledge of machines,

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted to him.

and employs whoever he can as his mechanic, he is at the mercy of his employees, and the public is at the mercy of both. With real automotive mechanics hard to find his chance of success is greatly hampered, and he certainly cannot develop a working force himself.

If the garage man himself were an engineer or mechanic he could supervise and instruct his helpers, and develop the much needed automobile mechanic, and until the garage man becomes able to give instructions or is able to employ a competent directing head, it will remain a case of the blind leading the blind.

There is already a tendency to elevate the business of the repair and garage man in the mind of the public. No doubt such is for the good of the industry. It will beget the public confidence in the efficiency of the mechanic, and his earning power will therefore be increased.

REGULATORY LAWS TEND TO BENEFIT PUBLIC AND INDUSTRY

The safety of the public is the first law of the land and has been the law since Roman times. The public health and safety, comfort, convenience, good order and welfare are paramount in every state, and the power to establish regulations to secure these things is inherent—a part of a state or nation's sovereignty. Most all of the regularity

laws in the automobile industry arise out of this fundamental principle.

We would not now, at least, advocate that the state proceed to impose a limitation upon the present free entrance into the automobile and garage business. However, everything done to elevate and dignify the business will tend to benefit every person engaged in the industry. The greatest benefactors of the race are those who render the greatest service, and does not the garage man render service? Certainly, then he is a benefactor, a man of as much importance in his community as a mere business man.

We may well look to more regulatory laws governing him in the future, and if he, as the owner, may be identified as a business head, then he will be compelled to employ competent and properly designated engineers. It is likely that in the future our present more competent mechanics will, through work and study, become automotive engineers along with those being trained in school and colleges.

Owner Not Liable

"A," a garage owner, trades in a used car. "B," a prospect for a used car, asks permission to run same for a day, and if satisfactory, he would purchase, otherwise pay \$10 for the use of same. "B" uses car and has a collision with "C." Is "A" liable to "C"? Would it make any difference whether "B" had the use of the car free, or if he paid for the use of it, as far as "A's" liability is concerned? What, if any, is the liability of an owner of a car, in case of an accident, if he lends it with or without compensation to another?—Holstein Bros. Garage.

Under the conditions you name the garage owner would not be liable, unless the injury and collision were due to the negligence of the prospective customer, and this prospect was known to the owner to be incompetent as a driver at the time the car was loaned.

There would be no difference whether the prospect paid for the use of the car or not. The owner might be held liable if the injury resulted from a defect in the car.

In general the owner is not liable for injuries inflicted by the lessee, whether the car be loaned with or without compensation.

Gear Ratios of 1920 Trucks

Motor Age Maintenance Data Sheet No. 126

One of a series of weekly pages of information
valuable to service men and dealers—save this page

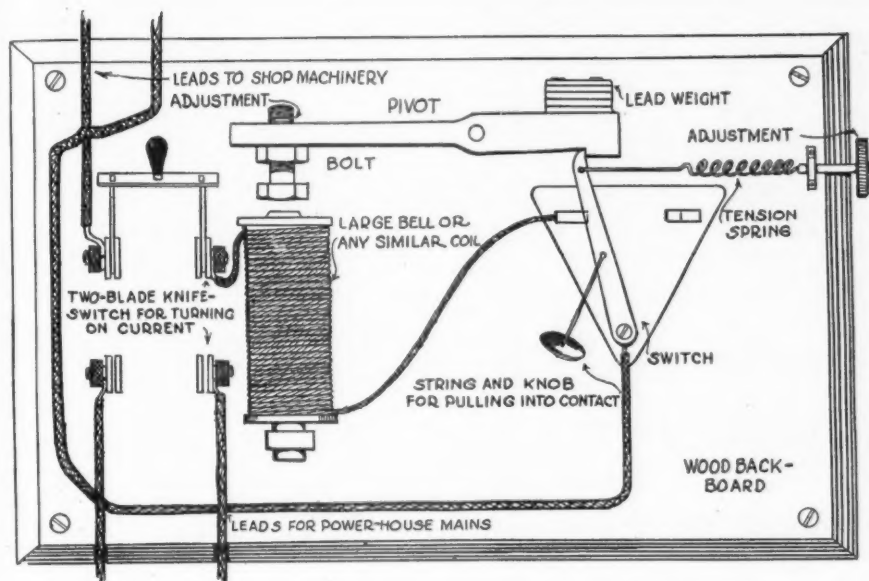
Continued from Last Week

Trade Name	Model	Capacity	1st Speed	2nd Speed	3rd Speed	4th Speed	Reverse	Rear Axle Ratio
Giant.....	15	1	3.3	1.68	1.	....	4.35	7.80
Giant.....	14	1½	3.3	1.68	1.	....	4.35	7.80
Giant.....	16	2	3.3	1.6	1.	....	4.32	8.66
Giant.....	17	3½	3.3	1.6	1.	....	4.3	10.25
Grant.....	17	1½	4.3	2.0	1.2	1.	5.0	....
Graham Bros.....	A	1½	4.	1.76	1.	....	3.5	7.00
Gramm-Bernstein.....	15	1½	3.	1.7	1.	....	3.5	7.22
Hal-Fur.....	D & E	1	3.30	1.60	1.	....	3.94	6.35
Hal-Fur.....	B & C	2½	4.	2.62	1.50	1.	4.80	7.00
Harvey.....	Wea	1½	3.5	1.7	1.	....	3.5	7.75
Harvey.....	Wfa	2½	4.84	2.84	1.76	1.	5.81	7.75
Harvey.....	Wha	3½	4.84	2.84	1.76	1.	5.81	8.75
Harvey.....	Wka	5	4.84	2.84	1.76	1.	5.81	8.75
Hawkeye.....	K	1½	3.97	1.88	1.	....	3.5	7.60
Hendrickson.....	I	2½	4.6	3.0	1.6	1.	6.5	7.75
Hendrickson.....	J	3½	4.8	3.0	1.6	1.	6.5	10.66
Highway.....	A	4	4.8	2.8	1.5	1.	5.8	8.75
Highway.....	B	5	4.3	2.7	1.5	1.	5.8	10.20
Huffman.....	C	1½	3.	1.71	1.	....	3.50	8.00
Huffman.....	B	1½	3.	1.71	1.	....	3.50	8.00
Independent.....	F	1	3	1.7	1.	....	3.5	8.8
Independent.....	G	2	3.2	3.8	1.	....	3.5	9.66
Indiana.....	12	1¼	3.65	1.69	1.	....	4.78	7.80
Indiana.....	20	2	5.35	2.62	1.76	1.	6.25	7.75
Indiana.....	25	2½	5.35	2.62	1.76	1.	6.25	7.75
Indiana.....	35	3½	5.35	2.62	1.76	1.	6.25	10.25
Indiana.....	51	5	4.84	2.84	1.76	1.	5.81	....
Inland.....	D	2	4.8	3.0	1.6	1.	6.5	....
International.....	H	¾	3.65	1.55	1.	....	4.31	7.00
International.....	F	1	3.22	1.55	1.	....	4.28	7.91
International.....	K	1½	3.35	1.55	1.	....	4.31	8.96
International.....	G	2	3.35	1.74	1.	....	4.31	8.96
International.....	L	3½	4.93	2.93	1.5	1.	5.89	10.98
J. & J.....	D	2	5.20	3.86	1.86	1.	4.44	....
Jackson.....	....	3½	4.73	2.93	1.61	1.	6.5	9.18
Jumbo.....	15	1½	4.0	1.7	1.	....	4.35	7.2
Jumbo.....	20	2	4.0	1.7	1.	....	4.35	....
Jumbo.....	25	2½	4.84	3.	1.6	1.	6.5	9.00
Jumbo.....	30	3	4.84	3.	1.6	1.	6.5	9.00
Jumbo.....	35	3½	5.35	3.09	1.76	1.	6.42	....
Jumbo.....	40	4	5.35	3.09	1.76	1.	6.42	10.00
Kalamazoo.....	G20	1½	4.8	3.0	1.6	1.	6.5	8.50
Kalamazoo.....	H20	2½	4.8	3.0	1.6	1.	6.5	8.75
Kalamazoo.....	K20	3½	4.8	3.0	1.6	1.	6.5	10.25
Kankakee.....	Ep	2½	3.66	1.81	1.	....	4.58	....
Karavan.....	A	2½	4.84	2.84	1.76	1.	5.81	....
Kearns.....	H	¾	3.	1.89	Direct	....	3.62	6.00
Kearns.....	N	1½	2.985	1.733	Direct	....	3.90	8.00
Kelly-Springfield.....	K34	1½	3.67	1.60	1.	....	4.37	8.66
Kelly-Springfield.....	K38	2½	4.75	2.70	1.6	1.	5.95	10.33
Kelly-Springfield.....	K40	3½	3.02	1.6	1.	....	3.80	10.5
Kelly-Springfield.....	K41	3½	5.07	3.04	1.63	1.	6.76	10.00

(Continued next week)

The Automotive Repair Shop

Practical Maintenance Hints



Simple Magnetic Circuit Breaker

A circuit breaker to prevent blowing fuses is of advantage for use in garages where electrical equipment is used or where storage batteries are being charged to prevent overcharging, also in the shop or home where electrical devices that are subject to short circuiting are installed. The sketch illustrates a simple form of cut-out or circuit breaker using an iron core with turns of insulated wire as a magnet for tripping a catch and releasing a switch when a short or resistance in the line would otherwise blow the fuse or burn the wiring.

A three point switch with a connection through the handle to a coil spring and a catch lip is held in contact by means of a catch holding the spring open. The opposite end of the catch extends

above the coiled iron core in such a position that a pull in the direction of the magnet will snap the catch out of engagement permitting the spring to release the switch. The magnetism of the coil is immediately increased under the conditions where a short is made in the line or any overloading occurs. Two points of adjustment are provided to vary the release for different loads to be carried on the circuit.

New Methods for Magnet Charging

A new method has been discovered for recharging the magnets of a magneto. It is a method that anyone can apply since no equipment is required and removal of

Help Your Fellow Dealer Save Time

MECCHANICAL problems are being solved in repair shops every day. You, perhaps, have devised a time and labor-saving device. Send us a brief description and a sketch showing how it operates. Give your name and address. **MOTOR AGE** will send you a dollar for every idea accepted and published.

the magnets is not necessary. It consists simply in operating the armature at an extremely high speed for a few minutes. This can be done by removing the magneto from the engine and bringing the edge of the coupling into contact with a belt. If no belt is available the rear wheel of a car may be jacked up and driven at fair speed by the engine, when the edge of the coupling can be brought into contact with the tire. If the tire has a non-skid tread, the side wall may be used for driving the magneto. It is difficult to explain how charging takes place but it is evident that the windings on the armature must aid in setting up a magnetic field which becomes sufficiently strong at high speeds to produce the effect desired.

Use Lemon and Salt as Cleaner for Brass or Nickel

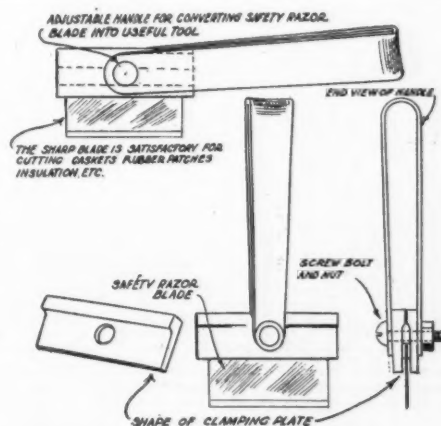
One-half of a cut lemon and salt will be found a satisfactory cleaner for brass surfaces that are badly tarnished. Simply dip the lemon into the salt and rub on the brass, wiping afterward with a gasoline soaked rag. Tarnish on nickeled parts can also be removed with this method, being sure immediately after this treatment, to clean the surface with a gasolined rag and remove any remaining acid left by the lemon.

Safety Razor Blades Useful in Shop

Safety razor blades that have passed their usefulness for shaving purposes are serviceable in the garage for numerous details of work.

If you have an excess quantity of these old blades, make a simple holder as indicated in the sketch and the blade can be used in either position. This handle consists of two flat pieces of steel and a "U" shaped piece secured with a bolt and nut making the renewal of the blade possible.

Cutting rubber patches for inner tubes, cutting gaskets for plates or connections, scraping off insulation from wires, cleaning up electrical connections, brushes and similar parts, cleaning piston heads and valves of carbon or even scraping



patches of hardened tar from the body are a few of the many purposes to which the safety razor blade can be advantageously put.

Shellac and Grease for Replacing Gaskets

In replacing any kind of gasket, use shellac on one side and grease on the other. This will prevent injuring them when removed again and has been found to hold good and they will come off easy. —A. D. Stuehrn, Square Deal Garage, Peotone, Ill.

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N.A.C.C.H.P.	Carburetor Size and Make	Gear Ratio	Clutch	Chassis	Chassis	Universal	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Ace	5	2260 110	32x4	32x4	Firestone	3 1/2 x 5	H-S	6	25 35	1 1/2 - Strom.	4.50	Warner	Warner	Warner	Detroit	Spacke	Gemmer	Stewart	Firestone	6	170	U. S. L.	A-L	A-L	A-K	6	Ace
Allen 43	5	1595 110	32x4	32x4	Miller	3 1/2 x 5	Own	4	19 60	1 - Strom.	4.60	B. and B.	B. and B.	Own	Detroit	Columbia	Own	Stewart	Stanwell	6	95	U. S. L.	West.	West.	Conn.	6	Allen 43
American Beauty	5	2250 121	32x4	32x4	optional	3 1/2 x 5	H-S	6	25 35	1 1/2 - Strom.	4.50	B. and B.	B. and B.	Warner	Hart	Salisbury	Warner	V. Sicken	Firestone	6	100	Willard	G. & D.	G. & D.	West.	6	American Beauty
Anderson Series 30	5	2145 120	32x4	32x4	Goodrich	3 1/2 x 4 1/2	Cont.	6	25 35	Ray.	4.50	B. and B.	B. and B.	Durston	Arme	Salisbury	Jacox	Stewart	Firestone	6	111	Willard	Remy	Remy	West.	6	Anderson Series 30
Apperson Anniversary	7	4250 130	34x4 1/2	34x4 1/2	Goodyear	3 1/2 x 5	Own	8	33 80	1 1/2 - John.	4.25	Own	Own	Own	Sterling	Own	Own	V. Sicken	Firestone	6	110	Willard	Bijur	Bijur	Remy	6	Apperson Anniversary
Apperson 8-20	7	3500 130	34x4 1/2	34x4 1/2	Goodyear	3 1/2 x 5	Own	8	33 80	1 1/2 - John.	4.25	Own	Own	Own	Sterling	Own	Own	V. Sicken	Firestone	6	110	Willard	Bijur	Bijur	Remy	6	Apperson 8-20
Auburn 6-39 H & K	5	1895 120	32x4	32x4	Goodrich	3 1/2 x 4 1/2	Cont.	6	25 35	1 - Ray.	4.60	B. and B.	B. and B.	Detroit	Arme	Stan-Par	Ditweiler	Stewart	Firestone	6	100	Exide	A-L	A-L	West.	6	Auburn 6-39 H & K
Beggs 6	5	2000 120	32x4	32x4	Goodrich	3 1/2 x 4 1/2	Cont.	6	25 35	1 - Strom.	4.50	B. and B.	B. and B.	Own	Hartford	Salisbury	Warner	Stewart	Firestone	6	100	Exide	A-L	A-L	West.	6	Beggs 6
Bel	5	1495 114	31x4	31x4	Miller	3 1/2 x 4 1/2	H-S	4	22 50	1 - Strom.	4.50	B. and B.	B. and B.	Own	Spicer	Salisbury	Warner	Stewart	Firestone	6	115	Willard	West.	West.	A-K	6	Bel
Bour-Davis 21 S.	7	2585 126	33x4 1/2	33x4 1/2	Goodyear	3 1/2 x 5 1/2	Cont.	6	29 40	1 1/2 - Zen.	4.50	Muncie	Muncie	Muncie	Spicer	Salisbury	Lavine	Stewart	Firestone	6	115	Willard	West.	West.	West.	6	Bour-Davis 21 S. & R.
Bradley Four	5	1265	32x4	32x4	Goodyear	3 1/2 x 5 1/2	Cont.	6	25 35	1 - Strom.	4.50	B. and B.	B. and B.	Own	Own	Own	Own	Stewart	Firestone	12	80	U. S. L.	U. S. L.	U. S. L.	West.	6	Bradley Four
Brewster	5	9000 125	34x4 1/2	34x4 1/2	Kelly-S	4x5 1/2	Own	4	25 60	1 1/2 - Strom.	4.50	Own	Own	Own	Own	Own	Own	Stewart	Hayes	6	80	U. S. L.	U. S. L.	U. S. L.	West.	6	Brewster
Briscoe 4-34	5	1285 109	31x4	31x4	optional	3 1/2 x 5	Own	4	18 23	1 -	4.18	Own	Own	Own	Own	Own	Own	Stewart	Hayes	6	80	U. S. L.	U. S. L.	U. S. L.	West.	6	Briscoe 4-34
*Buick 21-45	5	1795 118	32x4	32x4	Goodyear	3 1/2 x 4 1/2	Own	6	27 34	Mar.	4.00	Own	Own	Own	Own	Own	Own	Stewart	Own	6	80	Willard	Delco	Delco	Delco	6	*Buick 21-45
*Buick 21-49	7	2055 124	34x4 1/2	34x4 1/2	Goodyear	3 1/2 x 4 1/2	Own	6	27 34	Mar.	4.00	Own	Own	Own	Own	Own	Own	Stewart	Own	6	80	Willard	Delco	Delco	Delco	6	*Buick 21-49
Cadillac 50	7	3940 132	33x5	33x5	optional	3 1/2 x 5 1/2	Own	8	31 25	1 1/2 - Own*	5.07	Own	Own	Own	Spicer	C-Timk.	Own	V. Sicken	Kelsey	6	118	Willard	Delco	Delco	Delco	6	Cadillac 50
Case V	7	2650 126	34x4 1/2	34x4 1/2	Goodyear	3 1/2 x 5 1/2	Cont.	6	29 40	1 1/2 - Ray.	4.45	B. and B.	B. and B.	Own	Peters	Col.	Jacox	V. Sicken	Firestone	6	106	Willard	West.	West.	Delco	6	Case V
Chalmers 35-C	5	1795 117	32x4	32x4	optional	3 1/2 x 4 1/2	Own	6	25 35	1 - Strom.	4.50	Own	Own	Own	Own	Own	Own	Stewart	Stanwell	6	80	Willard	Delco	Delco	Delco	6	Chalmers 35-C
Chalmers 35-B	7	1945 122	33x4 1/2	33x4 1/2	optional	3 1/2 x 4 1/2	Own	6	25 35	1 - Strom.	4.50	Own	Own	Own	Own	Own	Own	Stewart	Stanwell	6	80	Willard	Delco	Delco	Delco	6	Chalmers 35-B
Champion 4-40	5	1350 116	32x3 1/2	32x3 1/2	Goodrich	3 1/2 x 5	Lyco	4	19 60	1 - Zen.	4.25	B. and B.	B. and B.	Own	Own	Peru	C. A. S.	V. Sicken	Stanwell	6	80	Willard	Delco	Delco	Delco	6	Champion 4-40
Chandler	7	1395 118	32x4	32x4	Goodrich	3 1/2 x 5	H-S	4	19 60	1 - Zen.	4.25	B. and B.	B. and B.	Own	Own	Peru	C. A. S.	V. Sicken	Stanwell	6	80	Willard	Delco	Delco	Delco	6	Chandler
Chevrolet 4-90	7	1895 123	33x4	33x4	Goodrich	3 1/2 x 5	Own	6	29 40	1 1/2 - Ray.	4.40	Own	Own	Own	Harford	Own	Warner	Stewart	Per-Jack.	6	105	Willard	G. & D.	G. & D.	Remy	6	Chevrolet 4-90
Chevrolet F. B.	5	820 102	31x4	31x4	Goodyear	3 1/2 x 4 1/2	Own	4	27 7	1 1/2 - Zen.	4.62	Own	Own	Warner	Own	Own	Warner	Stewart	Per-Jack.	6	105	Willard	A-L	A-L	Remy	6	Chevrolet F. B.
Cleveland 40	5	1345 110	32x4	32x4	Goodyear	3 1/2 x 5 1/2	Own	6	21 60	1 - Strom.	4.45	B. and B.	B. and B.	Mechanics	Harford	Own	Ditweiler	V. Sicken	Firestone	6	94	Willard	G. & D.	G. & D.	Bosch	6	Cleveland 40
Climber 4	5	1650 117	32x4	32x4	Goodyear	3 1/2 x 5	H-S	4	19 60	1 - Strom.	4.80	B. and B.	B. and B.	B-L	Harford	Own	Warner	V. Sicken	Jacox	6	120	Willard	West.	West.	Bosch	6	Climber 4
Cole Aero Eight 870	7	2750 120	32x4 1/2	32x4 1/2	Goodyear	3 1/2 x 5	H-S	6	25 35	1 - Strom.	4.75	B. and B.	B. and B.	North.	Harford	Col.	Warner	V. Sicken	Firestone	6	125	Willard	Delco	Delco	Delco	6	Cole Aero Eight 870
Columbia C	5	1795 115	32x4	32x4	Firestone	3 1/2 x 4 1/2	Cont.	6	25 35	1 - Strom.	4.45	B. and B.	B. and B.	Durston	Spicer	Timken	Gemmer	Warner	Firestone	6	125	Willard	Delco	Delco	Delco	6	Columbia C
Comet C-53	5	2350 125	33x4 1/2	33x4 1/2	Firestone	3 1/2 x 5 1/2	Cont.	6	29 40	1 - Strom.	4.66	B. and B.	B. and B.	Muncie	Arvoe	Col.	Gemmer	Stewart	Firestone	6	120	Willard	Wagner	Wagner	Wagner	6	Comet C-53
Commonwealth 4-40	5	1595 117	32x4	32x4	Goodrich	3 1/2 x 5	H-S	4	19 60	1 - Carter	4.25	B. and B.	B. and B.	Own	Detroit	Peru	C. A. S.	V. Sicken	Stanwell	6	105	Willard	Dyn.	Dyn.	A-K	6	Commonwealth 4-40
Craig-Hunt	5	103 30x3 1/2	30x3 1/2	30x3 1/2	...	3 1/2 x 4	Own	6	29 40	1 - Strom.	4.22	B-L	B-L	Own	Sterling	Timken	Gemmer	Stewart	Firestone	6	110	Willard	West.	West.	Bosch	6	Craig-Hunt
Crawford 20-6-40	7	3000 123 1/2	32x4	32x4	...	3 1/2 x 5 1/2	Cont.	6	29 40	1 - Strom.	4.22	B-L	B-L	Own	Sterling	Timken	Gemmer	Stewart	Firestone	6	110	Willard	West.	West.	Bosch	6	Crawford 20-6-40
Crow-Ellhart L-55-4	5	1295 117	32x4 1/2	32x4 1/2	Firestone	3 1/2 x 5	Lyco	4	19 60	1 - Zen.	4.25	B. and B.	B. and B.	Covett	Cont.	Peru	Ditweiler	Stewart	Firestone	6	80	Willard	Dyn.	Dyn.	Conn.	6	Crow-Ellhart L-55-4
Crow-Ellhart S-65-6	5	1545 117	33x4	33x4	Firestone	3 1/2 x 5	H-S	4	25 35	1 - Zen.	4.25	B. and B.	B. and B.	Covett	Cont.	Peru	Ditweiler	Stewart	Firestone	6	80	Willard	Dyn.	Dyn.	Conn.	6	Crow-Ellhart S-65-6
Cunningham V-4	7	142 35x5	35x5	35x5	optional	3 1/2 x 5	Own	8	45 00	1 - Strom.	4.08	B-L	B-L	Own	Saad	Timken	Gemmer	Warner	Firestone	6	120	Willard	Delco	Delco	Delco	6	Cunningham V-4
Daniels D	7	4850 132	34x4 1/2	34x4 1/2	optional	3 1/2 x 5 1/2	Cont.	8	39 20	1 1/2 - Strom.	4.40	Own	Own	Own	Spicer	Timken	Gemmer	Stewart	Firestone	6	145	Willard	Delco	Delco	Delco	6	Daniels D
Davis 51	5	2085 120	32x4	32x4	Goodrich	3 1/2 x 4 1/2	Cont.	6	25 35	1 - Strom.	4.75	B. and B.	B. and B.	Warner	Peters	Timken	Warner	Stewart	Firestone	6	80	Willard	Delco	Delco	Delco	6	Davis 51
Dixie Flyer H-S-70	5	1285 114	32x4	32x4	Fiak	3 1/2 x 4 1/2	H-S	4	19 60	1 - Strom.	4.72	B. and B.	B. and B.	Own	Ther H	Peru	C. A. S.	J. Man.	Keley	12	50	Willard	N. E.	N. E.	Own	6	Dixie Flyer H-S-70
Dodge Brothers	7	4785 132	33x5	33x5	Goodyear	4x5	Own	6	34 03	1 1/2 - Strom.	4.16	Own	Own	Warner	Spicer	Timken	Ross	V. Sicken	Firestone	6	130	Willard	West.	West.	Bosch	6	Dodge Brothers
Dorris 6-80	5	1095 105 1/2	30x3 1/2	30x3 1/2	Goodyear	3 1/2 x 5	Own	6	34 03	1 1/2 - Strom.	4.07	Own	Own	Mechanics	Spicer	Flint	Jacox	Stewart	Cleveland	6	95	U. S. L.	West.	West.	Bosch	6	Dorris 6-80
Dort 15	5	4000 124	32x4 1/2	32x4 1/2	Goodyear	3 1/2 x 5 1/2	Own	4	24 75	1 - Carter	4.50	B-L	B-L	Own	Spicer	Col.	Jacox	Stewart	Firestone	6	105	Exide	West.	West.	Conn.	6	Dort 15
du Pont A	5	1895 115	33x4	33x4	Goodrich	3 1/2 x 4 1/2	Cont.	6	25 35	1 - Zen.	4.50	B. and B.	B. and B.	Durston	Spicer	Salisbury	Ditweiler	Stewart	Firestone	6	90	Willard	A-L	A-L	Conn.	6	du Pont A
Economy 6-46	5	1795 116	33x4	33x4	Firestone	3 1/2 x 4 1/2	Cont.	6	25 35	1 - Strom.	4.50	B. and B.	B. and B.	Muncie	Spicer	Salisbury	Ditweiler	Stewart	Firestone	6	90	Willard	Delco	Delco	Delco	6	Economy 6-46
Elcar 6	5	1495 116	33x4	33x4	Firestone	3 1/2 x 5	Lyco	4	19 60	1 - Strom.	4.50	B. and B.	B. and B.	Own	Peters	Salisbury	C. A. S.	Stewart	Stanwell	6	90	Willard	Delco	Delco	Delco	6	Elcar 6
Elcar 4	5	1495 116	33x4	33x4	Firestone	3 1/2 x 5	Lyco	4	19 60	1 - Strom.	4.50	B. and B.	B. and B.	Own	Peters	Salisbury	C. A. S.	Stewart	Stanwell	6	90	Willard	Delco	Delco	Delco	6	Elcar 4

Engines—Ruten, Ruten; Cont., Continental; Weid, Weid; North, North; Ray, Ray; Rayfield, John, Johnson; Mar, Mar; Marvel, Sund, Sunderman; Siew, Stewart; H-K, Holley-Kingston; New, Newcomb; Schob, Schobler; Tilot, Tilotson; Johns, Johnston. Fuel feed vacuum except Van Dervoort. Carburetor—Strom, Stromberg; Zen, Zenith; Ray, Rayfield; John, Johnson; Mar, Marvel; Sund, Sunderman; Siew, Stewart; H-K, Holley-Kingston; New, Newcomb; Schob, Schobler; Tilot, Tilotson; Johns, Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. Generator and Motor—A-L, Auto-Lite; West, Westinghouse or Auto-Lite; W-L, Ward-Leonard; Dyn, Dyneto; N. E., North East; L-N, Leese-Neville; A-C, Allis-Chalmers; Split, Splitdorf; S-H, Simcoe-Huff; G & D, Gray & Davis. Ignition—A-K, Atwater-Kent; Conn, Connecticut; Else, Elsemann; West, Westinghouse; Will, Willard; N. E., North East; K-Remy, Kingston-Remy; Berl, Berling; Bosch-W, Bosch-Westinghouse; Split, Splitdorf; Gears—G-L, Grant-Less; North, Northway; B-L, Brown-Lipe. Rear Axle—Col, Columbia; W-W, Walker-Weiss; C-Timk, Cadillac-Timken; West-Mott, Weston-Mott. Universal Machine Co. Speedometer—J-Man, John-Manville; V-Sicken, Van Sicken; A-C, Allis-Chalmers; * 1921 Model.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H. P.	Carburetor	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltage	Name and Model	
Elgin Series K	5	1775	118	33x4	optional	31x44	Falls	6	23.44	1-Stron.	5.09	B. and B.	Mechanics	Mechanics	Col.	C. A. S.	V. Sicken	Firestone	6	90	Willard	Wagner	Wagner	Wagner	6	Elgin Series K	
Essex A	5	1595	108	32x4	optional	31x5	Own	4	18.23	1-Stron.	5.09	Own	Own	Spicer	Timken	Gemmer	Stewart	Kelsey	6	105	Exide	Delco	Delco	Delco	6	Essex A	
Fergus	6	128	32x4	32x4	Firestone	31x5	Cont.	6	25.35	Zen.	...	B. and B.	G-L	Peters	Col.	Gemmer	Warner	Firestone	6	120	Willard	Bijur	Bijur	Delco	6	Fergus	
Ferris C-20	7	3350	130	32x4	32x4	31x5	Own	6	29.40	Zen.	...	Own	Own	Own	Own	Own	Stewart	...	12	60	Tudor	Own	Morelli	12-16	6	Ferris C-20	
Fiat 510-6	7	6450	134	35x5	...	21x55	Own	6	22.50	1-H-K	3.63	Own	Own	Own	Own	Own	Stewart	...	6	80	opt.	Own	Own	Own	12-16	6	Fiat 510-6
Ford T	5	440	100	30x3	32x4	31x4	Own	4	22.50	1-H-K	4.33	Own	Own	Own	Own	Own	Stewart	...	12	60	Willard	Dyn.	A-K	A-K	12	6	Ford T
Franklin 9-B	5	2600	115	32x4	Goodyear	31x5	Own	4	19.60	1-Carter	4.33	B. and B.	Mechanics	Peters	W-Weiss	Ditweiler	Stewart	...	6	87	Willard	Dyn.	West.	West.	15	6	Franklin 9-B
Gardner	5	1185	112	32x3	Goodyear	31x5	Lyc.	4	19.60	1-Carter	4.5	B. and B.	Mechanics	Hart	Flint E	C. A. S.	Stewart	...	6	88	Exide	Dyn.	Supreme	Delco	6	6	Gardner
Globe Four, B-10	5	1995	122	32x4	Goodyear	31x5	Ruten.	4	23.44	1-Stron.	4.5	B. and B.	Warren	North	Eaton	Gemmer	V. Sicken	Firestone	6	105	Exide	Delco	Delco	Delco	6	6	Globe Four, B-10
Globe Four, B-10	5	1800	115	32x4	Firestone	31x5	Supreme	4	18.2	1-Stron.	4.63	B. and B.	Durston	Spicer	Columbis	Jacox	V. Sicken	Firestone	6	105	Pres.	Bijur	A-K	A-K	6	6	Globe Four, B-10
Grant H-X	5	1550	116	32x4	optional	31x44	Walker	6	22.52	1-Stron.	4.63	B. and B.	G-L	Ther-H	Timken	Gemmer	V. Sicken	Firestone	6	102.6	U. S. L.	A-L	A-L	Conn.	6	6	Grant H-X
Handley-Knight	7	125	125	32x4	Fisk	41x4	Knight	4	27.23	1-Till.	4.45	B. and B.	G-L	Ther-H	Timken	Gemmer	Stewart	...	6	80	Pres.	Delco	Delco	Delco	6-8	6	Handley-Knight
Hanson 54-A	5	2365	121	32x4	optional	31x44	Cont.	4	16.90	1-Mar.	4.00	Own	G-L	Own	Adams	Lavine	Stewart	...	6	80	Pres.	Remy	Remy	Remy	6-8	6	Hanson 54-A
Harron A-A-2	5	1195	108	30x3	Miller	31x5	Own	4	16.90	1-Stron.	4.50	B. and B.	G-L	Own	Peru	Ditweiler	Stewart	...	6	80	Pres.	Remy	Remy	Remy	6	6	Harron A-A-2
Harvard	5	1695	115	32x4	Goodyear	31x5	H-S	4	16.90	1-Zen.	4.50	B. and B.	G-L	Own	Col.	Jacox	Warner	...	6	123	Willard	Dyn.	Conn.	A-K	6	6	Harvard
Hatfield A-42	5	3635	132	34x4	optional	31x5	Own	12	36.30	1-Ray.	4.12	B. and B.	Own	Arvac	Own	Jacox	Warner	...	6	123	Willard	Dyn.	Conn.	A-K	6	6	Hatfield A-42
Haynes 48	7	3185	132	34x4	optional	31x5	Own	6	29.40	1-Ray.	4.77	B. and B.	Own	Arvac	Own	Jacox	Warner	...	6	123	Willard	Dyn.	Conn.	A-K	6	6	Haynes 48
Haynes 47	7	3185	132	34x4	optional	31x5	Own	6	29.40	1-Ray.	4.77	B. and B.	Own	Arvac	Own	Jacox	Warner	...	6	123	Willard	Dyn.	Conn.	A-K	6	6	Haynes 47
H. C. S.	4	2975	120	32x4	Goodyear	31x5	Weid	4	21.03	1-Stron.	4.41	Warner	Fuller	Own	Own	Gemmer	Stewart	...	6	80	U. S. L.	West.	West.	Delco	6	6	H. C. S.
Holier 200-B	7	3350	128	34x4	Goodyear	31x44	Cont.	6	25.35	1-Zen.	4.41	Fuller	Fuller	Own	Timken	Gemmer	Stewart	...	6	80	U. S. L.	West.	West.	Delco	6	6	Holier 200-B
Hudson O	7	2400	125	34x4	optional	31x5	Own	6	29.40	1-Newe.	4.90	B-L	B-L	Spicer	Timken	Gemmer	Stewart	...	12	105	Exide	Delco	Delco	Delco	12	6	Hudson O
Huffman R	5	1695	115	32x4	Goodyear	31x5	H-S	4	16.90	1-Stron.	4.87	Own	Covert	Detroit	Salisbury	Jacox	Stewart	...	6	80	Willard	Dyn.	Conn.	A-K	6	6	Huffman R
Hupmobile R	5	1695	115	32x4	Goodyear	31x5	H-S	4	16.90	1-Stron.	4.87	Own	Covert	Detroit	Salisbury	Jacox	Stewart	...	6	80	Willard	Dyn.	Conn.	A-K	6	6	Hupmobile R
Jackson 6-38	5	2150	121	33x4	Goodyear	31x44	Cont.	6	25.35	1-Stron.	4.87	Own	Covert	Detroit	Salisbury	Jacox	Stewart	...	6	94	U. S. L.	A-L	A-L	Remy	6	6	Jackson 6-38
Jaquet, Flyer	7	2750	128	32x4	Goodyear	31x5	Wis.	6	29.40	1-Ray.	...	B. and B.	Warner	Snead	Timken	Gemmer	Waltham	...	6	130	Exide	Bijur	Bijur	Delco	6	6	Jaquet, Flyer
Jones 28	7	2750	128	32x4	Goodyear	31x5	Cont.	6	29.40	1-Ray.	4.50	B. and B.	G-L	Arvac	Stan-Par	C. A. S.	Stewart	...	6	130	Exide	Bijur	Bijur	Delco	6	6	Jones 28
Jordan F	7	2875	127	32x4	Goodyear	31x5	Cont.	6	29.40	1-Ray.	4.08	Detroit	Detroit	Spicer	Timken	Gemmer	V. Sicken	Firestone	6	118	Willard	Delco	Delco	Delco	6	6	Jordan F
Jordan M	5	2650	120	32x4	Goodyear	31x44	Cont.	6	25.35	1-Stron.	4.66	Detroit	Detroit	Spicer	Timken	Gemmer	V. Sicken	Firestone	6	94	Willard	Delco	Delco	Delco	6	6	Jordan M
Kenworthy 4-80	5	5000	130	32x4	optional	31x44	Duesen.	4	25.60	1-Stron.	4.08	B-L	B-L	Ther-H	Col.	Ross	Warner	...	6	140	Exide	Bijur	Bijur	Delco	6	6	Kenworthy 4-80
Kenworthy 6-55	5	4250	130	32x4	optional	31x5	Cont.	6	29.40	1-Stron.	4.08	B-L	B-L	Ther-H	Col.	Ross	Warner	...	6	140	Exide	Bijur	Bijur	Delco	6	6	Kenworthy 6-55
King H	7	2725	120	32x4	optional	31x5	Own	8	28.80	1-Ball	4.08	Detroit	Warner	Ther-H	Col.	Jacox	V. Sicken	Standard	6	120	Pres.	West.	West.	Boech	6	6	King H
Klinekar 6-55	5	7475	124	32x4	Goodyear	31x5	Own	6	28.80	1-Ball	4.25	Warner	Warner	Spicer	Own	Jacox	Stewart	...	6	120	Pres.	West.	West.	Boech	6	6	Klinekar 6-55
La Fayette	7	5625	132	33x5	Firestone	31x5	Own	6	26.75	1-Stron.	4.50	B. and B.	Own	Own	Own	Wahlrab	Stewart	...	6	120	Pres.	Wagner	Wagner	Delco	6-8	6	La Fayette
Leach 20-A	5	5200	126	32x4	Goodyear	31x5	Cont.	6	25.35	1-Ray.	4.50	B. and B.	Own	Own	Own	Liberty	Stewart	...	6	180	Pres.	Delco	Delco	Delco	6-8	6	Leach 20-A
Lexington 8	5	2285	122	32x4	optional	31x44	Cont.	6	25.35	1-Ray.	4.62	B. and B.	Warner	Hardy	Own	C. A. S.	Stewart	...	6	100	Willard	G-D	G-D	Wagner	6	6	Lexington 8
Liberty 10-C	5	1795	117	32x4	Goodyear	31x5	Own	6	23.44	1-Stron.	4.66	B. and B.	Detroit	Spicer	Timken	Gemmer	Stewart	...	6	90	Willard	Wagner	Wagner	Wagner	6	6	Liberty 10-C
Lincoln	7	4600	130	33x5	...	31x5	Lyc.	4	16.90	1-Zen.	...	B. and B.	G-L	...	...	...	Stewart	...	6	140	Exide	Delco	Delco	Delco	6	6	Lincoln
Lone Star	7	7550	142	35x5	options 1	41x5	Own	4	48.60	1-Own	3.80	Own	G-L	Own	Own	Own	Stewart	...	6	140	Exide	West.	West.	Delco	6	6	Lone Star
Locomotive 48	5	1575	114	32x4	options 1	41x5	Own	4	48.60	1-Own	3.80	Own	G-L	Own	Own	Own	Stewart	...	6	140	Exide	West.	West.	Delco	6	6	Locomotive 48
Lorraine	5	1575	114	32x4	Republic	31x5	H-S	4	19.60	1-John.	4.75	B. and B.	Own	Acme	Standard	Gemmer	Stewart	...	6	94	U. S. L.	West.	West.	Delco	6	6	Lorraine
Malibon B	5	1575	116	32x4	Fiak	31x5	Own	6	23.44	1-Till.	4.50	B. and B.	Own	Flexite	Own	Buyrus	Stewart	...	6	94	U. S. L.	West.	West.	Delco	6	6	Malibon B
Marmon 34	7	5000	138	32x4	optional	31x5	Own	6	33.75	1-Stron.	3.75	Own	Own	Spicer	Own	Own	V. Sicken	Stanwell	6	162	Willard	Delco	Delco	Delco	6	6	Marmon 34
Maxwell 25	5	995	109	30x3	31x4	31x5	Own	4	21.03	1-Stron.	3.58	Own	Own	Own	Own	Own	Stewart	...	6	87	Willard	Delco	Delco	Delco	6	6	Maxwell 25
McFarland 147	7	6300	140	35x5	Goodyear	41x6	Own	4	22.50	1-Ray.	3.80	B. and B.	B-L	Peters	Timken	Gemmer	Stewart	...	6	120	Willard	West.	West.	Delco	6	6	McFarland 147
Merced Series 5	7	3950	132	32x4	optional	31x5	Own	4	22.50	1-Ray.	3.80	Own	Own	Spicer	Own	Gemmer	Warner	...	6	182	Willard	West.	West.	Delco	6	6	Merced Series 5
Meteor K R	4	5500	129	32x4	optional	31x5	Duesen.	4	25.60	1-Ray.	4.41	B. and B.	Own	Own	Standard	Gemmer	Warner	...	6	182	Willard	Bijur	Bijur	Delco	6	6	Meteor K R
Mets Master 6	5	1995	120	32x4	Goodyear	31x5	Ruten.	4	25.60	1-Ray.	4.63	B. and B.	B-L	Hart	Timken	Own	Stewart	...	6	110	Willard	G-D	G-D	Conn.	6	6	Mets Master 6
Mitchell F-40	5	1750	120	33x4	...	31x5	Cont.	6	25.35	1-Ray.	4.41	B. and B.	B-L	Own	Timken	Own	Stewart	...	6	110	Willard	Remy	Remy	Delco	6	6	Mitchell F-40
Monitor M. & Ser. 3	5	2475	121	33x4	Miller	31x5	Cont.	6	25.35	1-Ray.	4.41	B. and B.	G-L	Own	Stan-Par	C. A. S.	Stewart	...	6	90	Willard	Dyn.	Dyn.	Conn.	6	6	Monitor M. & Ser. 3
Monroe 8-9	5	1440	115	32x3	Goodyear	31x44	Own	4	16.90	1-Zen.	4.50	Own	Muncie	Universal	Own	C. A. S.	Stewart	...	6	80	U. S. L.	A-L	A-L	Conn.	6	6	Monroe 8-9

Engines—Ruten. Rutenber. Cont. Continental; Wead. Weidely; North. H.S. Herschell-Spillman; Lyco. Lycoming; D-Lyco. Dort-Lycoming; G. B. & S. Golden, Belknap & Swartz; T-McTeator-McFarland; Monson or Duesenberg; R. & V. Root & Van Dervoort. Carburetor—Strom. Stromberg; Zen. Zenith; Ray. Rayfield; John. Johnson; Mar. Marvel; Sund. Sunderman; Slew. Stewart; H-K. Holley-Kington; Newc. Newcomb; Schieb. Schieber; Tillot. Tillotson; Johna. Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. Gravity. Generator and Motor—A-L. Auto-Lite; West. Westinghouse; f. Westinghouse or Auto-Lite; W-L. Ward-Leonard; Dyn. Dyneto; N. E. North East; L-N. Leeco-Neville; A-C. Allis-Chalmers; Split. Spildorf; S-H. Simms-Huff; G. & D. Gray & Davis. Ignition—A-K. Atwater-Kent; Conn. Connecticut; Elie. Esenmann; West. Westinghouse; Will. Willard; N. E. North East; K-Remy. Kingston-Remy; Berl. Berling; Bosch-W. Bosch-Westinghouse; Split. Spildorf. Gearset—G-L. Grant-Lee; North. Northway; B-L. Brown-Lipe. Rear Axle—Col. Columbia; W-Weiss. Walker-Weiss; C-Timk. Cadillac-Timken; West-Mott. Weston-Mott. Universal—Hart. Hartford; Ther-H. Thermoid-Hardy; U. M. Co., Universal Machine Co. Speedometer—J-Man. John-Manville; V-Sicken. Van Sicken; A-C. Allis-Chalmers.

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	Carburetor	Ratio	Clutch	Gearbox	Universal	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Moon 6-48	5	1985	122	32x4	Miller	3 1/2 x 4 1/2	Cont.	6	25 30 1 1/2 Ray.	4.66	B. and B.	B-L	Spicer	Timken	Warner	Stewart	Firestone	6	110	Exide	Delco	Delco	Delco	6	Moon 6-48
Moon 6-48	7	2485	125	32x4 1/2	Miller	3 1/2 x 5 1/2	Cont.	6	29 40 1 1/2 Ray.	4.45	B. and B.	B-L	Spicer	Timken	Warner	Stewart	Firestone	6	110	Exide	Delco	Delco	Delco	6	Moon 6-48
Nash 4	5	1395	112	32x3 1/2	Miller	3 1/2 x 5	Cont.	4	16 90		B. and B.														Nash 4
Nash 681	5	1695	121	33x4	optional	3 1/2 x 5 1/2	Own	6	25 35 1 1/2 Mar.	4.50	B. and B.	Own	Own	Own	Gemmer	Stewart	Firestone	6	100	Willard	Wagner	Wagner	Wagner	6	Nash 681
Nash 682	7	1875	127	34x4 1/2	optional	3 1/2 x 5 1/2	Own	6	25 35 1 1/2 Mar.	4.50	B. and B.	Own	Own	Own	Gemmer	Stewart	Firestone	6	100	Willard	Wagner	Wagner	Wagner	6	Nash 682
National Sixlet BB	7	3750	130	32x4 1/2	optional	3 1/2 x 5 1/2	Own	6	29 40 1 1/2 Ray.	4.08	B. and B.	B-L	Arvac	Col.	Warner	Warner	Firestone	6	110	Pres.	West.	West.	West.	6	National Sixlet BB
Nelson D	5	1700	104	32x4	Goodyear	3 1/2 x 4 1/2	Own	4	15 63 1 1/2 Zen.	4.25	Own	Own	Own	Timken	Own	Stewart	Kelsey	12	72	Willard	U. S. L.	U. S. L.	Bosch	12	Nelson D
Noma 1-B	4	2200	128	32x4 1/2	Goodyear	3 1/2 x 4 1/2	Cont.	6	25 35 1 1/2 Zen.	4.45	B. and B.	Detroit	Spicer	Timken	Lavine	Stewart	Houk	6	104	Willard	Delco	Delco	Delco	6	Noma 1-B
Norwalk 4-30 K-S	5	1285	116	32x3 1/2	Firestone	3 1/2 x 5	Lyc.	4	19 60 1 1/2 Zen.	4.50	B. and B.	G-L	Universal	Peru	Ditweiler	Stewart	Firestone	10		Willard	Dyn.	Dyn.	Delco	6	Norwalk 4-30 K-S
Oakland 34-C	5	1395	115	32x4	Goodyear	2 1/2 x 4 1/2	Own	6	19 00 1 1/2 Mar.	4.50	Own	Muncie	Mechanics	West-Mott	Jacox	Stewart	Jaxon	6			Remy	Remy	Remy	6	Oakland 34-C
Ogren 6-60	6	3500	132	33x5	Goodyear	3 1/2 x 5 1/2	Own	6	29 40 1 1/2 Ray.	4.10	Hosier	Muncie	Hart	Col.	Lavine	Warner	Firestone	6	120	Willard	Bijur	Bijur	Bosch	6	Ogren 6-60
Oldsmobile 37-A	5	1450	112	32x4	Goodyear	2 1/2 x 4 1/2	Own	6	18 99 1 1/2 John.	4.58	Own	Warner	Spicer	West-Mott	Jacox	Stewart	Jaxon	6	80	Willard	Remy	Remy	Remy	6	Oldsmobile 37-A
Oldsmobile 46	7	2100	122	33x4 1/2	Goodyear	3 1/2 x 4 1/2	Own	8	26 45 1 1/2 Ball.	4.91	Own	Warner	Spicer	Peru	Warner	Stewart	Jaxon	6	80	Willard	Delco	Delco	Delco	6	Oldsmobile 46
Olympian 45	5	1585	112	32x3 1/2	Goodyear	3 1/2 x 4 1/2	Own	4	16 90 1 1/2 Stron.		B. and B.	Own	Detroit	Peru	Warner	Stewart	Perman	6					Conn.	6	Olympian 45
Overland 4	5	895	100	30x3 1/2	Fisk	3 1/2 x 4	Own	6	18 23 1 1/2 Tiltot #	4.50	Own	Own	Spicer	Own	Own	Stewart	Firestone	24	80	U. S. L.	A-L	A-L	Conn.	6	Overland 4
Owen-Magnetic 60	7	7000	142	35x5 1/2	optional	4 5/8 x 4 1/2	Own	6	38 40 1 1/2 Zen.	3.87	Own	Own	Spicer	Stan-Par.	Own	Waltham	Firestone	6		Exide	Own	Own	Delco	28	Owen-Magnetic 60
Packard Single Six	5	3640	116			3 1/2 x 4 1/2	Own	6	27 34 1 1/2 Zen.		Own	Own	Ther-H	Own	Own			6			A-K	A-K	Delco	6	Packard Single Six
Packard Twin Six	7	6000	136	35x5 1/2	optional	3 1/2 x 5 1/2	Own	12	43 20 1 1/2 Zen.	4.36	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	120	Willard	Bijur	Bijur	Delco	7	Packard Twin Six
Paige 6-42	5	1770	119	32x4	optional	3 1/2 x 5	Own	6	23 44 1 1/2 Stron.	4.50	B. and B.	Own	Spicer	Salisbury	Jacox	Stewart	Kelsey	6	111	Willard	G. & D.	G. & D.	A-K	6	Paige 6-42
*Paige 6-66	7	2795	131	33x4 1/2	optional	3 1/2 x 5	Cont.	6	33 75 1 1/2 Ray.	4.55	B. and B.	Own	Spicer	Salisbury	Jacox	Stewart	Kelsey	6	111	Willard	G. & D.	G. & D.	A-K	6	*Paige 6-66
Paragon	5	2000	122			3 1/2 x 5 1/2	Own	6	22 50	4.25	B. and B.	Own	Ther-H	Own	Own	Stewart	Jaxon	6-8	84	U. S. L.	Bijur	Bijur	Conn.		Paragon
Paterson 6-50	7	2130	120	32x4	optional	3 1/2 x 4 1/2	Cont.	6	25 35 1 1/2 Stron.	4.50	B. and B.	Own	Harford	Stan-Par.	Own	Stewart	Jaxon	6	80	Willard	Delco	Delco	Delco	6	Paterson 6-50
Peetless Series 6	7	3230	125	34x4 1/2	Goodyear	3 1/2 x 5 1/2	Own	8	33 80 1 1/2 Ball.	4.90	Own	Own	Spicer	Own	Gemmer	Stewart	Firestone	6	125	Willard	A-L	A-L	Delco	6	Peetless Series 6
Phaiana R	5	9500	125	32x4 1/2	U. S.	3 1/2 x 6	Own	6	24 70 1 1/2 Stron.		Own	Own	Own	Amer.	Own	Warner	Firestone	6			Dyn.	W-L	Bosch	6	Phaiana R
Piedmont 4-30	5	1485	116	32x3 1/2	Firestone	3 1/2 x 5	Lyc.	4	19 60 1 1/2 Carter	4.45	B. and B.	G-L	Harford	Peru	Ditweiler	Stewart	Firestone	6	90	Willard	Dyn.	Dyn.	Delco	6	Piedmont 4-30
Piedmont 6-40	5	1945	122	32x4	Goodyear	3 1/2 x 4 1/2	Cont.	4	19 60 1 1/2 Carter	4.45	B. and B.	G-L	Harford	Peru	Ditweiler	Stewart	Firestone	6	90	Willard	Dyn.	Dyn.	Delco	6	Piedmont 6-40
Pierce-Arrow 38	7	7500	134	34x4 1/2	Goodyear	4 5/8 x 4 1/2	Own	6	25 35 1 1/2 Stron.	4.45	B. and B.	Own	Norwalk	Spacke	Lavine	Stewart	Goodrich	6-8	135		Remy	Remy	Remy	6	Pierce-Arrow 38
Pierce-Arrow 48	7	8000	142	35x5 1/2	Goodyear	4 1/2 x 5 1/2	Own	6	38 40 1 1/2 Zen.	3.78	Own	Own	Own	Own	Own	Waltham	Goodrich	6-8	135		West.	West.	Delco	6	Pierce-Arrow 48
Pilot 6-45	5	1895	120	32x4	Miller	3 1/2 x 5	Tector	6	23 44 1 1/2 Tiltot.	4.90	B. and B.	Own	Hart	Spacke	Ditweiler	Stewart	Standard	6	100	Pres.	Delco	Delco	Delco	6	Pilot 6-45
Porter 46	7	9400	124	35x5 1/2	U. S.	4 1/2 x 5 1/2	Own	4	18 21 1/2 Zen.	3.00	M. and E.	Own	Own	Own	Own	Stewart	Firestone	12	1 1/2	Pres.	West.	West.	Beal.	12	Porter 46
Premier 6-D	7	4600	126 1/2	32x4 1/2	Firestone	3 1/2 x 5 1/2	Own	6	27 34 1 1/2 John.	4.50	B. and B.	Own	Peters	Stan-Par.	Warner	Stewart	Firestone	6	120	Willard	Delco	Delco	Delco	6	Premier 6-D
Premocar, 4-30	5	1350	118	32x3 1/2	Firestone	3 1/2 x 5	H-S	4	19 60 1 1/2 Zen.	4.50	B. and B.	Own	Universal	Timken	Ditweiler	Stewart	Firestone	6		Willard	Dyn.	Dyn.	Conn.	6	Premocar, 4-30
Ranger	4																								Ranger
Reo T-6	5	1850	120	32x4	U. S.	3 1/2 x 5	Own	6	24 30 1 1/2 Ray.	4.66	Own	Own	Own	Own	Own	Stewart	Firestone	6	108	Willard	N. E.	N. E.	N. E.	6	Reo T-6
Revere C	7	4650	131	32x4 1/2	optional	4 1/2 x 6	Duesenb'g	6	30 63 1 1/2 Stron.	3.44	B. and B.	B-L	Spicer	Standard	Gemmer	Stewart	Houk	6	120	Willard	West.	West.	Bosch	6	Revere C
Roamer C-54	8	3250	128	32x4 1/2	Goodyear	3 1/2 x 5 1/2	Cont.	6	29 40 1 1/2 Stron.		B. and B.	G-L	Ther-H	Stan-Par.	Jacox	Warner	Stanwell	6	90	Col.	Bijur	Bijur	Bosch	6	Roamer C-54
R & V Knight J	7	3350	127	32x4 1/2	optional	3 1/2 x 4 1/2	Own	6	29 40 1 1/2 Stron.	4.90	B. and B.	B-L	Spicer	Timken	Own	Stewart	Firestone	6	117	Willard	Wagner	Wagner	Wagner	6	R & V Knight J
Saxon	5	1895	112	32x4		3 1/2 x 5	Rev.	4	18 25 1 1/2 Stron.	4.75	Detroit	Covet	Peters	Own	C. A. S.	Stewart	Firestone	6	80	Pres.	Wagner	Wagner	Saxon	6	Saxon
Sayers Six	5	2195	118	33x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	25 35 1 1/2 Stron.		B. and B.	G-L	Arvac	Stan-Par.	Warner	Stewart	Firestone	6	80	Willard	Delco	Delco	Delco	6	Sayers Six
Scripps-Booth B-39	5	1545	115	32x4	Goodyear	2 1/2 x 4 1/2	North.	6	18 99 1 1/2 Mar.	4.50	North.	Warner	Peters	West-Mott	Warner	Stewart	Kelsey	6	85	Pres.	Remy	Remy	Remy	6	Scripps-Booth B-39
Seneca L	5	1185	108	30x3 1/2	Miller	3 1/2 x 4 1/2	Le Roi	4	15 63 1 1/2 Stron.	4.75	B. and B.	Warren	Universal	Peru	Ditweiler	Stewart	Jaxon	6	88	Pres.	A-C	A-C	Conn.	6	Seneca L
Severin H	5	2550	122 1/2	32x4 1/2	Miller	3 1/2 x 5 1/2	Cont.	6	29 40 1 1/2 Zen.	4.50	B. and B.	Muncie	Peters	Salisbury	Lavine	Stewart	Firestone	6	110	Camp.	Wagner	Wagner	Wagner	6	Severin H
S. G. V.	7	5500	136	33x5 1/2	Firestone	2 1/2 x 5 1/2	Wied.	12	39 68		B-L		Ther-H	Timken	Jacox	Warner	Firestone	6	123	Vesta	West.	West.	Philbrin		S. G. V.
Shaw	5-7						North	8	30 20		%		Spicer			Warner						Delco			Shaw
Sheridan 8	5-7						North	4					Spicer			Warner						Delco			Sheridan 8
Sheridan 4	5-7						North	4					Spicer			Warner						Delco			Sheridan 4
Skelton 35	5	1295	112	32x3 1/2	optional	3 1/2 x 5 1/2	Lyc.	4	19 60 1 1/2 Carter	4.25	B. and B.	Muncie	Universal	Peru	C. A. S.	Stewart	Stanwell	6	85	Pres.	West.	West.	Conn.	6	Skelton 35
Spacke S-20	2	345	50	28x3 1/2	U. S.	3 1/2 x 3 1/2	Own	2	1 1/2 Carter	5.09	Own	Own	Universal	Own	Own	Stewart	Stanwell	6					A-K		Spacke S-20

Engines—Rutten, Ruben; Cont., Continental; Weid, Weidely; North, Northway; H-S, Herschell-Spillman; Lyco, Lycoming; D-Lyco, Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTear-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. Carburetor—Strom, Stromberg; Zen, Zenith; Ray, Rayfield; John, Johnson; Mar., Marvel; Sund, Sundman; Stew, Stewart; H-K, Holley-Kinzston; Newc, Newcomb; Scheb, Schieber; Tiltot, Tilloston; Johns, Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. Generator and Motor—A-L, Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N, Leece-Neville; A-C, Allis-Chalmers; Split, Splitter; S-H, Simme-Hull; G. & D., Gray & Davis. Ignition—A-K, Atwater-Kent; Conn., Connecticut; Elec., Eichenmann; West, Westinghouse; Will, Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W, Bosch-Westinghouse; Split, Splitdorf. Gearset—G-L, Grant-Lees; North, Northway; B-L, Brown-Lipe. Rear Axle—Conn., Connecticut; Elec., Eichenmann; West, Westinghouse; Will, Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W, Bosch-Westinghouse; Split, Splitdorf. Universal Machine Co. Speedometer—J-Mas, Johnson-Manville; V-Sichon, Van Sichon; A-C, Allis-Chalmers. # 1921 Model.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Boys and Stroke	Engine Make	No. Cylinders	Carburetor Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Time	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Standard 8-L	7	3400	127	34x4	Fisk or Firestone	31x5	Own	8	N. A. C. C. H.P.	4.45	B. and B.	G-L	Arvac	Timken	Gemmer	Stewart	Firestone	6	100	Willard	West.	West.	Opt.	6	Standard 8-L
Stanwood	5	2050	118	33x4	Firestone	31x4 1/2	Cont.	6	11" Strom.	4.50	B. and B.	G-L	Peters	Stan-Par	Gemmer	.....	Stanwood	6	.....	Willard	West.	A-K	.....	Stanwood
Stearns SK14	5	2450	125	34x4 1/2	Goodrich	31x5 1/2	Own	4	25 35 11" Schieb.	4.50	B. and B.	Own	Spicer	Own	Own	V. Sicklen	Firestone	12	65	Willard	West.	A-K	.....	Stearns SK14
Stearns 80	6	2400	122	33x4 1/2	Fisk	31x5 1/2	Own	6	22 30 11" Tillot.	4.9	B. and B.	Mechanics	Timken	Own	C. A. S.	Stewart	Firestone	6-8	116	U. S. L.	A-L	Conn.	.....	Stearns 80
Stevens-Duryea	7	8000	138	35x5	optional	4 1/2 x 5 1/2	Own	6	47 25 "Strom.	.....	Own	Own	Own	Own	Own	Walham	Firestone	6	.....	.....	West.	Wagner	.....	Stevens-Duryea
Studebaker E-J	5	1485	112	32x4	Goodyear	31x4 1/2	Own	6	23 44 "Strom.	4.55	Own	Own	Ther-H.	Own	Own	Stewart	Keley	6	80	Willard	Wagner	Wagner	.....	Studebaker E-J
Studebaker E-G	7	2150	126	33x4 1/2	Goodyear	31x5	Own	6	36 04 11" Ball.	3.70	Own	Own	Spicer	Own	Own	V. Sicklen	Keley	6	80	Willard	Wagner	Wagner	.....	Studebaker E-G
Studebaker E-H	5	1750	119	32x4	Goodyear	31x5	Own	6	29 40 11" Strom.	4.33	Own	Own	Spicer	Own	Own	V. Sicklen	Keley	6	80	Willard	Wagner	Wagner	.....	Studebaker E-H
Stutz H	6	4000	130	32x4 1/2	optional	41 x 6 1/2	Own	4	30 63 11" Strom.	3.50	Own	Own	Own	Own	Gemmer	Warner	.....	6	130	Willard	Remy	Remy	.....	Stutz H
Templar A-445	5	2885	118	32x4	optional	31x5 1/2	Own	4	18 23 11" Strom.*	4.40	B. and B.	Detroit	Hardy	Peru	C. A. S.	Stewart	Firestone	6	80	Prest.	Bijur	Bijur	.....	Templar A-445
Texas B-38	5	1495	115	33x4	Southland	31x5	Lyc.	4	19 60 "Car.	4.50	B. and B.	Muncie	Salisbury	Salisbury	Gemmer	V. Sicklen	Firestone	6	120	Willard	Bijur	Bijur	.....	Texas B-38
Tulsa E	5	1550	117	33x4	Firestone	5x3 1/2	E-S	6	19 60 11" Zen.	4.66	B. and B.	Durston	Arvac	Col.	Gemmer	V. Sicklen	Firestone	6	100	Willard	Bijur	Bijur	.....	Tulsa E
Velle 48	5	1885	115	32x4	Goodyear	31x4 1/2	Cont.	6	25 35 11" Strom.	4.60	B. and B.	Durston	Arvac	Col.	Gemmer	V. Sicklen	Firestone	6	108	Willard	A-L	A-L	.....	Velle 48
Velle 54	5	1385	112	32x3 1/2	Miller	31x4 1/2	Falls	6	21 44 "Ray.	4.50	B. and B.	Warner	Norwalk	Salisbury	Ditweiler	Stewart	Firestone	6	108	Willard	A-L	A-L	.....	Velle 54
Vogue 6-55	5	2285	124	32x4	Goodrich	31x5	H-S	6	25 35 "Schieb.	4.50	B. and B.	Warner	Norwalk	Salisbury	Ditweiler	Stewart	Firestone	6	145	Exide	West.	West.	.....	Vogue 6-55
Vogue 6-66	5	2485	124	33x4 1/2	Goodrich	31x5 1/2	Cont.	6	29 40 "Strom.	3.10	B. and B.	Warner	Norwalk	Salisbury	Ditweiler	Stewart	Firestone	6	108	Willard	A-L	A-L	.....	Vogue 6-66
Wasp	5	6500	132	33x5	Firestone	4 1/2 x 5 1/2	Wis.	6	36 10 11" Strom.	5.09	B. and B.	Warner	Peters	Timken	Gemmer	V. Sicklen	Firestone	6	117	Willard	Delco	Delco	.....	Wasp
Westcott C-38	4	2290	118	33x4	Firestone	31x4 1/2	Cont.	6	35 35 11" Ray.	4.45	B. and B.	Warner	Peters	Timken	Gemmer	V. Sicklen	Firestone	6	117	Willard	Delco	Delco	.....	Westcott C-38
Westcott C-48	7	2990	125	32x4 1/2	Firestone	31x5 1/2	Cont.	6	29 40 11" Ray.	5.00	Warner	Warner	Peters	Timken	Gemmer	V. Sicklen	Firestone	6	170	U. S. L.	A-L	A-L	.....	Westcott C-48
Willye-Knight 20	5	2195	118	33x4	Fisk	31x4 1/2	Own	4	21 03 1" Tillot.*	4.50	Warner	Warner	Ther-H.	Own	Own	Stewart	Stanweid	6	127	Willard	A-L	West.	.....	Willye-Knight 20
Winther 61	5	120	133	33x4	Goodyear	31x5	H-S	6	25 35 11" Strom.	4.50	Warner	Warner	Peters	.....	Lavine	Stewart	Firestone	6	139	Willard	Bijur	West.	.....	Winther 61
Winton 25	7	4600	132	35x5	optional	41 x 5 1/2	Own	6	33 75 11" Strom	4.90	.....	.....	.....	.....	.....	Warner	Firestone	6	139	Willard	Bijur	Bosch	.....	Winton 25

STEAM CARS

[illegible]

Engines—Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschall-Spillman; Lyco., Lycopom; Dort-Lycoming; G. B. & S., Golden, Balknap & Swartz; T-McTear-Taylor; J.S., Johnson or Duessenberg; K. & V., Root & Van Dervort. **Carburetor**—Strom, Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sundman; Scheblor, Scheller; Tillotson, Tillison; Johns, Johnston. Fuel feed vacuumexcept where otherwise indicated. *Pressure.

*Gravity. **Generator and Motor**—A.L., Auto-Life; West., Westinghouse; A.W.-Leonard; Dyn., Dynamo; N. E., North East; L-N., Leese-Naville; A-C., Allis-Chalmers; Split., Splittdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Alwater-Kent; Conn., Connecticut; Elise., Eisenmann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splittdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walkee-Weiss; C-Tink., Cadillac-Tinken; West-Mott, Weston-Mott. **Universale**—Hart., Hartford; Ther-Ho., Thermoid-Hardy; U. M. Co., Universal Machine Co.

The following are also listed under their respective headings:

L-Man, Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

Lighting the Automotive Building

(Continued from page 9.)

artificial light is electricity. Gas is used in some localities and very effective results are being obtained with it. There are on the market several types of gas fixtures which are very efficient and which produce an intense white light, obtained generally through the use of the incandescent Welsbach mantle.

However, electricity is becoming almost universal in its use, and because of its convenience it is destined to become the universal lighting medium. Now that the isolated lighting plant has been introduced most everywhere there remain but a very few dealers who have not electricity or who may not have it.

When considering artificial lighting in the salesroom there is more than the actual illumination to consider, for beauty and harmony must also be incorporated in the lighting scheme. Nowadays a motor car sales room is generally considered to be incomplete unless it is well appointed with comfortable furniture, having a mirror or two located at some strategic point where the woman purchaser may catch a glimpse of herself seated at the wheel of a car, having a few plants of one kind or another located in positions where they harmonize with the surroundings, all of which is incidental in importance to the illuminating system.

The indirect and the semi-indirect systems of illumination seem to be the types coming mostly into use. This method of lighting and the fixtures employed will be explained next week.

SAYERS SIX SALESMEN MEET

Cincinnati, Ohio, Nov. 28.—The entire sales force of the Sayers & Scovill Co., manufacturers of the Sayers Six, spent three days in conference with officials here. Optimistic forecasts emanated from the meeting. F. F. Scovill, vice-president and treasurer of the company, opened the conference. Various sections were presided over by E. E. Hess, general manager, and C. A. Eisenhart, sales manager. It was announced during the course of the sessions that a complete exhibit of all models of the Sayers Six will be on display as usual this winter at all the shows.

TRACTORS AT UNIVERSITY FARM

St. Paul, Minn., Nov. 26—Tractors will form one of the subjects taken up for consideration during Farmers' and Home-Makers' week at University farm, seat of the state college of Agriculture, Jan. 3-8.

NEW SAXON DISTRIBUTOR

Davenport, Iowa, Nov. 26—A. G. McMann, distributor, has taken over the distribution of the Saxon motor car in this territory.

From the Four Winds

Glimpses at the World of Motordom

COMING MOTOR EVENTS

Automobile Shows

Los Angeles, Cal.	Automobile Show	Dec. 11-20
Akron, Ohio	Automobile Show	Dec. 25-Jan. 2, 1921
New York	Highway Transportation Show	Jan. 3-8, 1921
Los Angeles, Cal.	Automobile Show	Jan. 7, 1921
New York	National Passenger Car Show	Jan. 8-15, 1921
Milwaukee	Annual Winter Show	Jan. 17-23, 1921
Schenectady, N. Y.	Annual Automobile Show	Jan. 16-22, 1921
Oklahoma City	Automobile Show	Jan. 17-22, 1921
San Francisco	Automotive Equipment Exposition	Jan. 22-27, 1921
Cleveland	Annual Automobile Show	Jan. 22-29, 1921
Montreal	Nat'l Motor Show of Eastern Canada	Jan. 22-29, 1921
Amsterdam, N. Y.	Annual Automobile Show	Jan. 23-29, 1921
Lawrence, Mass.	First Annual Show	Jan. 24-29, 1921
New Bedford, Mass.	Automobile Show	Jan. 25, 1921
Chicago	Automobile Salon	Jan. 29, 1921
Chicago	National Passenger Car Show	Jan. 29-Feb. 5, 1921
Hudson, N. Y.	Annual Automobile Show	Jan. 30-Feb. 5, 1921
Oakland, Calif.	Automobile Show	Jan. 31-Feb. 6, 1921
Minneapolis	Winter Show	Feb. 5-12, 1921
Newberg, N. Y.	Annual Automobile Show	Feb. 6-12, 1921
Rochester, N. Y.	Automobile Show	Feb. 7-12, 1921
Kansas City, Mo.	Annual Automobile Show	Feb. 12-19, 1921
Pittsburg, Mass.	Automobile Show	Feb. 12-19, 1921
Winnipeg	Western Canada Automotive Equipment Show	Feb. 14-19, 1921
San Francisco	Automobile Show	Feb. 19-26, 1921
Pittsfield, Mass.	Annual Automobile Show	Feb. 20-26, 1921
Louisville, Ky.	Automobile Show	Feb. 21, 1921
Deadwood, S. D.	Annual Automobile Show	Feb. 21-26, 1921
Clinton, Iowa	Sixth Annual Automobile Show	Feb. 23-26, 1921
Wichita, Kan.	Annual Automobile Show	March 1-5, 1921
Des Moines	Open Car Show	March 2-5, 1921
Des Moines	Closed Car Show	March 7-10, 1921
Indianapolis	Automobile Show	March 7-12, 1921
Boston, Mass.	Annual Show	March 12-19, 1921
Torrington, Conn.	Annual Automobile Show	Mar. 20-26, 1921
Gloversville, N. Y.	Annual Automobile Show	Apr. 3-9, 1921

Tractor Shows

Columbus, Ohio	National Tractor Show	Feb. 6-12, 1921
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Foreign Shows

Sydney, Australia	Automobile Show	Dec. 10
Delhi, India	Delhi Motor Car Show	Feb. 7, 1921

Conventions

Cincinnati	Ohio Automobile Trade Assn. Fourth Annual Convention	Dec. 8-10
Cedar Rapids, Iowa	Iowa Motor Trades Bureau	Dec. 8-9
Cincinnati	Annual Convention Ohio Automobile Jobbers' Assn.	Dec. 8-9
Columbia, S. C.	Annual Meeting South Carolina Automotive Trade Assn.	Dec. 9-10
New York	Automotive Service Associations	Jan. 10, 1921
Milwaukee	Wisconsin Automotive Dealers' Assn.	Jan. 19, 1921
Chicago	N. A. D. A. Annual Meeting	Jan. 31-Feb. 1, 1921
Chicago	Automotive Electric Service Association	Feb. 2-4, 1921

Races

Indianapolis Speedway	500 Mile Race	May 30, 1921
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Freight Cars of the Future



Above is a Bleriot four-engine commercial biplane. Power is obtained from four 300hp. Hispano-Suiza engines. Its total weight is 8½ tons when loaded and has risen to a height of 8900 ft. A tall man could walk under the lower wing of this air-liner

Business Notes

The Biddle & Smart Co., Amesbury, the largest manufacturers of automobile bodies in New England whose plant has been shut down for the past month, will resume operations at once. About 1,500 hands were employed in the busy season.

The Jacquet Motor Corp. of America, Belding, Mich., has voted to increase its capital stock from \$100,000 to \$250,000 to enable it to secure additional funds to take care of its future business.

The General Motors Acceptance Corp.'s executive offices have been moved to 120 West 42nd Street, New York City, on account of insufficient accommodations in the former quarters.

The Federal Motor Truck Co. is operating its factory in Detroit on a full time schedule according to an announcement made by M. L. Pulcher, vice-president and general manager. Sufficient orders are on their books to warrant the assumption that there need be no fear of the curtailment of production in the future and the company is making every preparation for an even greater output during the coming year.

The North American Storage Battery Co., which will begin the manufacture of starting and lighting batteries for automobiles and batteries for electric cars about Dec. 1, has leased 17,000 sq. ft. of floor space in Indianapolis for ten years.

Title has been taken by the American Motor Body Corp. from the Hale & Kilburn Corp., to the latter's factory in Philadelphia, including five five-story factory buildings and thirteen one and two-story mills and shops. The transfer was subject to a mortgage of \$2,000,000.

The Storm Mfg. Co. has been organized at Hartford, Wis., and leased a building which is being equipped for manufacturing special types of winter curtains for Ford and other open touring car and roadsters. Clifford Montgomery is manager.

A number of changes in the official personnel of the Falls Motors Corp., Sheboygan Falls, Wis., have been announced. H. W. Dilden, son of the president of the Fort Dearborn National Bank of Chicago, has been elected president. E. W. Ramsdell of Chicago, continues as vice-president. Henry Landwehr of Sheboygan becomes treasurer to succeed Konrad Schreier, Jr., who will enter another business in Chicago on Dec. 1. Mr. Landwehr has been auditor and is succeeded in that position by T. C. Widder.

The Economy Tool Co. of Green Bay, Wis., manufacturers of production tools for the automotive industries, expects to take occupancy of its new plant about Dec. 10.

The Standard Oil Co. of New York has closed a contract with the Mexican Petroleum Co. under which 150,000,000 barrels of gasoline will be delivered to the American corporation next year. The contract replaces one made a few years ago with the difference that the quantity to be delivered is much larger and the price substantially higher. The gasoline will be delivered to Standard Oil tankers at Tampico.

The Black & Decker Manufacturing Co., manufacturers of portable electric drills, electric valve grinders and electric air compressors, report that net sales as of Oct. 31, 1920 are 163 per cent of the total net sales of the year 1919. This shows that in eight months of this year their net sales have been almost two-thirds greater than the net sales during twelve months last year and the prospects are that the net sales of the entire year of 1920 will have been increased almost 100 per cent over 1919. While accomplishing this increase in production and sales the company has developed a modern residential community for Black & Deckerites.

The Standard Parts Co. receivership will probably be lifted by Dec. 1 or shortly thereafter through ratification of the stockholders of the corporation of refinancing plan proposed by committees representing the creditors and stockholders.

Lexington Motor Co. has purchased for \$260,000 a building under erection on Fourteenth street, Long Island City, and will use it for a service and repair plant.